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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 31985 - 33008.

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AIR POLLUTION ABSTRACTS

31985-33008

JANUARY 1974

U.S. ENVIRONMENTAL PROTECTION AGENCY
Assistant Administrator for Air and Water Programs
Office of Air Quality Planning and Standards
Control Programs Development Division
Research Triangle Park, N. C. 27711

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AIR POLLUTION ABSTRACTS

VOLUME 5, NO. 1 JANUARY 1974

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

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RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

Contract No. 68-02-0584, Modification No. 7 .... *$64,515*
DEVELOPMENT AND FABRICATION OF A PARTICULATE GENERATOR SYSTEM FOR THE STATIONARY SOURCE SIMULATOR.
Aerotherm Division, Acurex Corporation, 585 Clyde Avenue, Mountain View, California 94040

Contract No. 68-02-0325, RFP No. Du-74-B343 .... *$48,436*
PLACENTAL POLLUTANT BURDEN STUDIES TO DETERMINE THE LEVELS AT WHICH ADVERSE HEALTH EFFECTS OCCUR.
Medical College of Georgia, Augusta, Georgia 30902

Contract No. 68-02-1266, RFP No. Du-73-B542 .... *$70,832*
STUDY OF FLUORESCENCE IMMUNOASSAY METHOD OF PESTICIDE MEASUREMENT.
Intelcom Rad Tech, 7650 Convoy Court, P. O. Box 80817, San Diego, California 92138

Contract No. 68-02-1565, RFP No. Du-74-C676 .... *$53,700*
CONVERSION OF MARK IV PROGRAMS FROM IBM 360/50 TO UNIVAC 1110 (APPROXIMATELY 50 PROGRAMS).
Dataware, Inc., 495 Delaware Street, Tonawanda, New York 14150

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1973

31985 **APTIC NO. 54207**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

A RESULT OF INVESTIGATION ON THE EMISSION FACTORS OF AIR POLLUTANTS --- MOBILE EMISSION SOURCES. *(Taiki osen busshitsu haisetsu keisu sanshutsu chosa --- ido hassei gen). Text in Japanese. 168p., Aug. 1973.*

Automobiles were studied to determine emission factors to assist in planning countermeasures for Tokyo. Typical cars and a diesel truck were run on 12 main and six auxiliary roads in Tokyo, and car speed and other factors were measured and analyzed by computer. The pollution emitted by each engine operating mode and emission factors were determined for gasoline and liquefied petroleum gas (propane) cars and diesel trucks. Light cars emit less nitrogen oxides and more carbon monoxide and hydrocarbons than heavy cars.

31986 **APTIC NO. 54327**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

A RESULT OF INVESTIGATION ON THE EMISSION FACTORS OF AIR POLLUTANTS---THE PRESENT CONDITIONS AND FUTURE OF THE EMISSION INTENSITY OF AIR POLLUTANT. *(Taiki osen busshitsu haishutsu keisu sanshutsu chosa---taiki osen busshitsu no hasseigen betsu haishutsu kyodo no genjo to shorai yosoku). Text in Japanese. 157p., Aug. 1973.*

Emissions of pollutants from fixed and mobile sources in Tokyo were calculated. The emissions of stationary sources such as boilers and waste incinerators were classified by ward, city, mesh, business, facility, and fuel. Sulfur oxides, nitrogen oxides, floating dust, carbon monoxide, hydrocarbons, and aldehydes were measured. Carbon monoxide concentrations were higher in Japan than in the U. S. Nitrogen oxides, hydrocarbons, and aldehydes were higher in the U. S. than in Tokyo. Automobile exhausts were studied for 10 engine modes. Actual measurements were higher than 10-mode test, except for hydrocarbons.

31987 **APTIC NO. 54332**

Tokyo Metropolitan Government (Japan), Bureau of Environmental Protection

A RESULT OF INVESTIGATION OF THE EMISSION FACTORS OF AIR POLLUTANTS---FIXED EMISSION SOURCES. *(Taiki osen busshitsu haishutsu keisu sanshutsu chosa---kotei hasseigen). Text in Japanese. 96p., Aug. 1973.*

Sulfur oxides, nitrogen oxides, floating dusts, carbon monoxide, aldehydes and hydrocarbons were measured at an open hearth furnace, heating furnace, waste incinerator, electric furnaces, and a hydrocarbon evaporating facility. Sulfur oxides were determined by infrared spectrometry, chemiluminescence was used to measure NOx, and gas chromatography was used for CO. Total hydrocarbons were determined by flame ionization and aldehydes were measured by the MBTH method. The specific weight of the fuel seemed to cause differences in the data obtained in Japan and in the U. S. The NOx concentrations were lower than in previous work, possibly due to the boiler structure, fuel, or operating conditions. The CO emission factor was greater for a small boiler than in previous work, HC and aldehydes were lower.

31988 **APTIC NO. 54629**

AIR POLLUTION AND OIL HEATERS. *(Luftverschmutzung und Oelfeuerungen). Text in German. Oel Gasfeuerungen, no. 9:668-670, 1973.*

The combustion of fuel oil produces air pollutants such as sulfur oxides, soot, and the oxides of nitrogen. Much has been said about SOx as air pollutants. Soot in general can be described as unburned oil residues of varying character. At the combustion of light fuel oil, very compact small soot particles develop, heavy fuel oils yield rather thin-walled soot spheres. Soot particles contain sulfur trioxide which in combination with water forms sulfuric acid. It attacks lacquers of cars and walls of houses. The very small soot particles can be inhaled deep into the lungs. The oxides of nitrogen develop in oil heaters in three different ways. Through reaction between oxygen and nitrogen from the air, through separation of NO groups from the oil, and through the addition of nitrogen-containing additives. Experiences over the past few years have shown that the use of Bycosin improves the combustion of all types of fuels considerably. It reduced the SO3 concentration by 25%, the carbon monoxide concentration by nearly 30%, the soot concentration in the flue gases by 35%, and the wear of engines and boilers.

31989 **APTIC NO. 54753**

ENVIRONMENTAL PROBLEMS IN THE FIELD OF POWER GENERATION. *(Umweltprobleme im Bereich der E-Wirtschaft). Text in German. Umweltschutz Staedtereinig (Vienna), 10(8):179-181, 1973.*

The problems of environmental pollution by hydraulic, thermal, and nuclear power plants are discussed. Hydraulic power plants do not cause any direct air pollution. The air is indirectly polluted through combustion of the drift material. Thermal power plants pollute the air through combustion residues and gases such as sulfur dioxide in the flue gases. For larger soft coal and hard coal-fired power plants, mechanical dust collectors are considered inadequate and electrostatic precipitators are demanded in general which achieve a collection efficiency of 99%, as long as they are not dirty. In Austria, fuel oil with up to 2% sulfur may be used for firing power plants. Nuclear power plants neither draw oxygen from the ambient air nor pollute the neighborhood by combustion residues. The problems of thermal water pollution as they are presently being discussed in Switzerland and Germany do not exist in Austria since only few plants have been erected near water bodies.

31990 **APTIC NO. 55183**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Administration

AIR POLLUTION TRANSLATIONS: A BIBLIOGRAPHY WITH ABSTRACTS--VOL. 4. *Pub-AP-122, 149p., April 1973. 585 refs.*

NTIS: PB 222474

A compilation of abstracts of translations of technical air pollution literature is presented. Included are items on emission sources, control methods, measurement methods, air quality measurements, atmospheric interactions, basic science and technology, effects on human helath, effects on plants and livestock, effects on materials, economic effects, standards and criteria, and legal and administrative aspects. Author and subject indices are provided, along with a list of additional translations of air pollution items which are available through the National Technical Information Service.

31991 **APTIC NO. 55184**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Administration

AIR POLLUTION TRANSLATIONS: A BIBLIOGRAPHY WITH ABSTRACTS--VOL. 3. *Pub-AP-120, 255p., March 1973. 1500 refs.*

NTIS: PB 222475

A compilation of abstracts of translations of technical air pollution literature is presented. Included are general items and items on emission sources, control methods, measurement methods, atmospheric interactions, basic science and technology, effects on human health, effects on plants and livestock, effects on materials, economic effects, standards and criteria, legal and administrative aspects, and social aspects. Author and subject indices are provided, along with a list of addition translations of air pollution items which are available through the National Technical Information Service.

31992 **APTIC NO. 55290**

THE ACTUAL CONDITION OF NOISE AND BAD ODOR AND COUNTERPLANS FOR IT. *(Soon to akushu no jittai to taisaku ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 2(11):44-47, Nov. 1971.*

Complaints about bad odors in Japan increased from 3494 (17% of all air pollution complaints) in 1966 to 14,999 (23.6%) in 1970, to 17,746 (23.3%) in 1971. Poultry farming and hog raising industries cause 26.5% of the complaints, slaughterhouses cause 16.4%, the petrochemical industry causes 11%, pulping causes 3.7%, and sewage treatment causes 2%. Bad odors come from ammonia, mercaptans, hydrogen sulfide, amines, and methyl sulfide. Other odor sources include livestock raising, manure processing, fertilizer production, starch production, fish processing, and ammonia production.

31993 **APTIC NO. 54514**

Ayer, H. E., J. M. Dement, K. A. Busch, H. B. Ashe, B. T. H. Levadie, W. A. Burgess, and L. Diberardinis

A MONUMENTAL STUDY--RECONSTRUCTION OF A 1920 GRANITE SHED. *Am. Ind. Hyg. Assoc. J., 34(5):206-211, May 1973. 16 refs.*

The relationship between respirable mass measurements and silicosis were investigated statistically by operating a small granite shed in Barre, Vermont for 1 wk without any ventilation. The granite cutters were protected by respirators. Respirable dust concentrations up to 49 mg/cu m and respirable free silica concentrations up to 4.4 mg/cu m were observed. Average respirable dust concentrations were 10 to 20 mg/cu m, of which 15% was free silica. Under the conditions of the study, it appeared that 10 mppcf of granite dust was equivalent to about 0.2 mg/cu m of respirable free silica. In 1966-1967 studies it was observed that 10 mppcf of granite shed dust was equivalent to roughly 0.1 mg/cu m of respirable free silica. This suggests that the limit of 10 mmpcf recommended by Russell was perhaps equivalent to twice the present respirable mass TLV. (Author abstract modified)

31994 **APTIC NO. 54397**

Bastress, E. Karl

IMPACT OF AIRCRAFT EXHAUST EMISSIONS AT AIRPORTS. *Environ. Sci. Technol., 7(9):811-816, Sept. 1973. 5 refs.*

Current approaches to defining and evaluating the impact of aircraft emissions on the total air pollution in metropolitan areas are discussed. Public exposures of some pollutants at U. S. airports appear to exceed current standards, and emission control measures were proposed. Aircraft emission control regulations are likely to become more stringent with time to offset effects of increasing air traffic at airports. Evaluations of the impact of aircraft pollutant emissions in the U. S. were carried out in two rather distinct phases; the first phase concerned the contribution by aircraft to regional air pollutant burdens, and the second phase covered effects of aircraft emission in the immediate vicinities of airports. The carbon monoxide standards were exceeded over both the 8-hour and 1-hour averaging times in terminal areas and at sites near the airport boundaries, and aircraft contributed substantially to the concentrations at the terminals. The hydrocarbon standard also was exceeded in terminal areas, at airport boundaries, and in neighborhood areas adjacent to airports. The nitrogen dioxide standard was exceeded in areas adjacent to airports; however in no case had the aircraft contribution alone resulted in an excessive NO2 concentration. The particulate matter and sulfur dioxide standards were exceeded in airport vicinities. Future evaluation is likely to pertain to implementation of methods for controlling the impact of aircraft emissions and evaluation of the effectiveness of these control methods. (Author abstract modified)

31995 **APTIC NO. 54461**

Blagosklonov, K. N., A. A. Inozemtsev, and V. N. Tikhomirov

LOCAL INDUSTRIAL POLLUTION OF ATMOSPHERIC AIR. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 17-18. APTD-1366. Translated from Russian. (Also: Okhrana Prirody, 1967:88-89, 1967.)*

NTIS: PB 214264

Noxious aerosols are a grave problem in the USSR. Natural dusts include mineral dust from the lithosphere; organic dust, or the residue from living creatures; and cosmic dust, the residue of meteorites. Industrial pollution such as fly ash, soot, dust, dispersed industrial products, sulfur dioxide, carbon monoxide, hydrogen sulfide, carbon disulfide, chlorine, nitrogen oxides, and lead or mercury compounds, is emitted principally from thermoelectric power plants. Railroad transport is a major source of carbon, ash, and sulfur dioxide. A system of steps aimed at improving the living conditions in populous areas, including irrigation, planting, and mitigation of air pollution, will be implemented.

31996 **APTIC NO. 54759**

Blumenthal, V. L., J. M. Streckenbach, and R. B. Tate

AIRCRAFT ENVIRONMENTAL PROBLEMS. *J. Aircraft, 10(9):529-537, Sept. 1973. 4 refs. (Presented at the AIAA Annual Meeting and Technical Display, 9th, Washington, D. C., Jan. 8-10, 1973. Paper 73-[illegible].)*

The problems facing industry, the airlines, and local communities in a continuing reduction of noise and atmospheric pollution are discussed. Relative to noise pollution, the following areas deserve attention: the shortage of trained personnel; the shortage of acoustics research laboratory facilities; the lack of knowledge concerning the mechanics of noise, particularly from full-scale flight hardware; the need for a new high bypass turbofan engine in the 20,000 to 30,000 lb thrust class; the existence of airframe noise in the absence of engine noise; the lack of a reliable measure of noise acceptability for use in the initial planning and design of aircraft and engines; and the shortage of safe and economic equipment which will provide increased community noise benefits associated with noise abatement operating procedures. Efforts must be directed toward establishing aircraft engine emission standards that will form a basis for realistic and cost-effective design of future propulsion systems. It is important that such standards be derived through actual airport measurements and modeling, rather than the arbitrary legislation of unrealistic standards that are technically and economically out of balance with the total environmental picture. Land use is an important factor. (Author summary modified)

31997 **APTIC NO. 55182**

Cavender, James H., David S. Kircher, and Alan J. Hoffman

NATIONWIDE AIR POLLUTANT EMISSION TRENDS 1940-1970. *Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, Pub-AP-115, 59p., Jan. 1973. 16 refs.*

NTIS: PB 222739

Estimates of trends in a nationwide air pollution emissions for the five major pollutants (sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides) are presented. Detailed emission estimates for 1969 and 1970 are also provided. The year 1969 was selected as the base year; emissions for other years were calculated using methods and criteria in effect during 1969. In general, emissions of SOx and NOx increased steadily through 1970, while CO, particulate, and HC emissions peaked in 1968-1969 and either decreased or remained somewhat constant thereafter. Emissions are listed for motor vehicles, aircraft, vessels, railroads, fuel combustion in stationary sources, solid waste disposal, and open burning.

31998 **APTIC NO. 54513**

Coleman, L. E.

EFFECT OF UNLEADED GASOLINE ON EXHAUST EMISSION AND LUBRICANT PERFORMANCE. *J. Inst. Petrol. (London), 59(568):154-163, July 1973. 9 refs.*

Experimental work on the effects of unleaded gasoline on exhaust emissions and lubricant performance is described. The unleaded fuel gave more varnish, less rust, and slightly less sludge deposits. The unleaded fuel gave higher wear on certain engine parts, especially the exhaust valve seat. There was less oil thickening with the unleaded fuel. The unleaded fuel exhibited higher octane requirements at full throttle conditions. Spark plug fouling decreased with unleaded fuel. Additive compatibility was investigated; the addition of organic sulfur compounds to unleaded B regular gasoline markedly decreased. octane number. These effects are not firmly established and there is a need for continuing studies in this area. The effects of engine oils in Wankel engines operated on unleaded fuels were also studied. Unleaded and leaded gasoline effects on various cars were made.

31999 **APTIC NO. 54877**

Corbat, J. P.

AIR POLLUTION BY COMBUSTION ENGINES. *(Luftverschmutzung durch Verbrennungsmotoren). Text in German. Schweiz. Bauztg., 91(36): 844-859, Sept. 6, 1973. 46 refs. (Presented at the ETH Lausanne im Rahmen des Nachstudienzyklus Les bases scientifiques de la protection de l air, Dec. 1972.)*

The pollutants most commonly found in automobile exhausts such as carbon dioxide, carbon monoxide, hydrocarbons, the oxides of nitrogen, sulfur dioxide, solid particles and their effects on man and environment are reviewed. Spectroscopic analyzers, the flame ionization detector, chemiluminescence analyzers, the mass spectrometer, and soot measurement methods are described. Apart from the simple methods which draw a certain quantity of exhausts through a filter paper and measure the grey tone with a photocell, novel systems are available such as smokemeters. The tyndallometer measures the ligh reflected by particles perpendicularly to the direction of illumination. Smoke measurements are very controversial. Water vapor and oil mist as well as the sampling point have a considerable influence on the measurements whose evaluation differs among the individual methods and makes a comparison difficult. Catalytic and thermal afterburning is reviewed. A discussion of futuristic combustion engines includes the Wankel engine, the gas turbine, the Philips-Stirling-engine, steam engines, and fuel cells. In the near future no other engine will replace the conventional combustion engine. Efforts will have to concentrate on modification of the conventional engine to obtain more complete combustion with lower pollutant emissions.

32000 **APTIC NO. 55019**

Dimopoulos, N. P. and N. E. Geroyannis

DETERMINATION OF THE RELATIVE AIR-FUEL RATIO IN DIESEL ENGINES FROM EXHAUST GAS ANALYSIS. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1973. 13 refs. (Presented at the American Society of Mechanical Engineers, Diesel, and Gas Engine Power Conference and Exhibit, Washington, D. C., April 1-4, 1973.)*

A method for the reliable computation of the relative air-fuel ratio from diesel engine exhaust gas analysis is mathematically developed to provide accuracy sufficient for many purposes, especially energy balance computations. Appropriate formulas associating the carbon dioxide and oxygen content of the exhaust gas with the relative air-fuel ratio are given, and the influence of ambient conditions on the calculations is investigated in detail. The volum percentages of CO2 and/or O2 in the gas sample, drawn from the exhaust of the engine and cooled to the ambient temperature, are determined by measurement; and if the exhaust gas sample is chemically dried, the measured volume percentages of CO2 and/or O2 can be directly used for determination of the relative air-fuel ratio from the equations presented. (Author abstract modified)

32001 **APTIC NO. 54767**

Engels, Gerhard

FOUNDRIES AND ENVIRONMENTAL PROTECTION. *(Giessereiindustrie und Umweltschutz). Text in German. Giesserei (Duesseldorf), 60(19):597-603, 1973. 15 refs.*

Foundries deal with the emission of dust and waste gases through the special characteristic of their production processes. The example or the foundries in North Westphalia is indicative of what has been done with respect to reducing air pollution. In the years between 1964 and 1972 the installation of dust cleaning facilities and the improvement of existing facilities had progressed so far that more than half of the cupola furnaces complied with the existing limit values for pollutant emission. Further, 27% had been replaced by other melting plants, primarily induction furnaces. About 17% of the cupola furnaces had been taken out of operation. The most important melting aggregate in foundries is still the cupola furnace. For dust cleaning of the waste gases of cupola furnaces, cloth filters, scrubbers and electrostatic precipitators are currently used. Of the gaseous pollutants from cupola furnaces, carbon monoxide and sulfur dioxide play a role. Measurements on a larger number of cupola furnaces yielded an average SO2 emission of 0.6 kg/t of iron. With the aid of wet dust cleaning methods, between 30 and 70% of the SO2 is retained. All other desulfurization methods are too expensive at the moment. Carbon monoxide emissions amount to between 100 to 150 kg/t/iron. The main problem of foundries concerns the elimination of gaseous emissions liberated during the casting process. Such emissions can be brought under control only by simultaneously drawing off large air volumes. Odorous substances can be eliminated by thermal or catalytic afterburning.

32002 **APTIC NO. 54401**

Fay, James A.

UNUSUAL FIRE HAZARD OF LNG TANKER SPILLS. *Combust. Sci. Technol., 7(2):47-49, 1973. 6 refs.*

The spreading and evaporation rates of liquefied natural gas (LNG) spilled on water were estimated theoretically. An LNG spill on water will vaporize in great rapidity and spread to cover a large area at ground level. For a 10 to the 5th power cu m spill, a vapor cloud 1 km in radius and 6 m deep would be formed in less than 15 min. It is evident that if a given volume of LNG is leaked over a period of time greater than tau (the time to evaporate the entire spill by setting the heat required to freeze the ice equal to that required to evaporate the volume of LNG), it will be vaporized as fast as it leaks. It can be compared to the dirigible Hindenburg in which 2 times 10 to the 5th power cu m of pure hydrogen burned in several minutes. (A 100 cu m spill of LNG would form 2.5 times 10 to the 5th power cu m of vapor.) The burning of the full cargo of an LNG supertanker would be equivalent to 100 Hindenburgs.

32003 **APTIC NO. 54772**

Feola, Massimo

THE EVALUATION OF THE AIR-FUEL RATIO IN THE SPARK-IGNITION ENGINES BY THE EXHAUST ANALYSIS. *(Sulla determinazione del rapporto aria-combustibile nei motori a c.i. ad accensione comandata attraverso l analisi dei gas di scarico). Text in Italian. Termotecnica (Milan), 27(6):311-319, 1973. 18 refs. (Presented at the Congresso Nazionale ATI, 26th, L Aquila, Italy, Sept. 1971.)*

Methods employed in the assessment of the air-fuel ratio from combustion gases of internal combustion engines are essentially either based on the hypothesis of the water-gas frozen equilibrium constant or on the material balance hypothesis of the individual chemical components of the exhaust. The latter method is the more reliable because it is less affected with approximations. The equation for the air-fuel ratio deduced from the analysis of exhaust gas depends on the chosen value for the equilibrium constant of the water gas reaction; while the equation is complex it can be used in practice with the help of a computer. In order to compare results obtained by measuring the air-fuel ratio from exhaust gases with results obtained from determination of the mix aspired before combustion, bench experiments were performed. The accord found experimentally was rather good independently of whether the engine was idling or in gear; generally air-fuel ratios derived from exhaust gas analysis tend to be slightly higher than those derived from measurement during the aspiration stage of the components; all that is required is the availability of a gas chromatograph or an infrared analyzer.

32004 **APTIC NO. 55262**

Ferrari, Giancarlo

TEMPERATURE MEASUREMENTS OF EXHAUST-GAS IN INTERNAL COMBUSTION ENGINES. *(Rilievi di temperatura di gas di scarico di un motore a ciclo Otto). Text in Italian. Termotecnica (Milan), 27(8):444- 451, 1973. 12 refs. (Presented at the Congresso Nazionale ATI, 27th, Naples, Italy, Sept. 1972.)*

The effect of air-fuel ratio, spark advance, and other engine characteristics on exhaust gas temperature from an internal combustion engine was determined by means of a new temperature measuring device consisting of three thermocouples which eliminated the 10 to 15% errors occurring with a single thermocouple. The temperature was measured at a distance of about 10 cm from the exhaust valve, thus yielding thermal conditions directly relevant for an afterburner or a catalytic convertor. Simultaneously determined were revolutions/min, advance, fuel consumption, cylinder pressure, fuel-air ratio, cooling water temperature, oil temperature, and all other factors that could have a bearing on exhaust gas temperature. Only a 4 to 5% temperature difference was found between cylinders. Engine load had a decisive effect on exhaust gas temperature, a 10% load increase resulted in exhaust gas temperature reduction by about 50 cx with similar differences manifest in the intermediate load zone. Reduction of the richness of the mix slows down combustion and thus increases exhaust gas temperature. A 1000 rpm increase increases exhaust gas temperature by 20-50 C, depending on starting point. With increasing ignition advance, exhaust gas temperature tended to increase. The lowest exhaust gas temperature was achieved with a fairly rich fuel mix. By the use of an appropriately poor fuel mixture and by retarding spark ignition, the emission of carbon monoxide and of other incompletely burned substances can be reduced to a point where the engine will pass the USA 72 test.

32005 **APTIC NO. 54321**

Heisler, S. L., S. K. Friedlander, and R. B. Husar

THE RELATIONSHIP OF SMOG AEROSOL SIZE AND CHEMICAL ELEMENT DISTRIBUTIONS TO SOURCE CHARACTERISTICS. *Atmos. Environ., 7(6):633-649, June 1973. 20 refs.*

A method for calculating the number and chemical element size distribution of Pasadena aerosols in a polluted atmosphere was developed based on measured source characteristics and a chemical element balance for collected aerosol samples. Secondary formation processes for particulate matter significantly modify the primary source spectrum and are taken into account using certain models for the conversion processes. The calculated size and volume distributions compare well with experimental data. Calculations of the chemical element distribution with respect to size have also been made. A simplified model was adopted for sulfur oxide conversion. All the chloride in the minute aerosol component was replaced on a molar equivalent basis by sulfate and the resulting droplets assumed to be saturated. The volume of the supersaturated droplet remains close to the saturation value. The replacement of chloride accounted for 0.028 micrograms m of sulfate and 0.006 micrograms m of water were associated with the saturated droplets. Organics are also a secondary source. (Author abstract modified)

32006 **APTIC NO. 54796**

Hirst, Eric and John C. Moyers

EFFICIENCY OF ENERGY USE IN THE UNITED STATES. *Science, 179(4080): 1299-1304, March 30, 1973. 16 refs.*

Three uses of energy for which greater efficiency is feasible are described: transportation, space heating, and air conditioning. Shifts to less energy-intensive transportation modes could substantially reduce energy consumption; the magnitude of such savings would depend on the extent of such shifts and possible load factor changes. A hypothetical transportation scenaria is described which would have resulted in a 22% savings in energy for transportation in 1970, a savings of 2800 trillion Btu. To the homeowner, increasing the amount of building insulation and, in some cases, adding storm windows, would reduce energy consumption and provide monetary savings. If all homes in 1970 had had the economic optimum amount of insulation, energy consumption for redisential heating would have been 42% less than if the homes were insulated to meet the pre-1971 FHA standards, a savings of 3100 trillion Btu. Increased utilization of energy efficient air conditions and of building insulation would provide significant energy savings and help to reduce the peak power demands during the summer. A 67% increase in energy efficiency for room air conditioners would have saved 15.8 kwh in 1970. Thus it is possible, from an engineering point of view, to effect considerable energy savings in the United States. Such measures would not reduce the level of energy consumption, but they sould slow energy growth rates. (Author summary modified)

32007 **APTIC NO. 54880**

Kishii, T.

LOS ANGELES PHOTOCHEMICAL SMOG VIEWED FROM VISITOR. *(Taizaisha ga mita Los Angeles no kokagaku smogu). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 26(9):550, Sept. 1973.*

Atmospheric dispersion in Los Angeles is blocked by the surrounding mountains, and atmospheric pollution is increased by the dry air and strong sunlight. Pollutant concentrations are high during morning rush hour, between industrial areas and the main thoroughfares. Ozone and nitrogen oxide concentrations were higher than in Tokyo. The maximum level of concentration is much higher than in Tokyo, as illustrated by the peak value of ozone 0.5 at ppm, carbon monoxide at 50 ppm, and NOx at 0.25 ppm. The use of natural gas decreased the pollution. Hydrocarbons were not considered important pollutants. Eye irritation from ozone was slight. Many pollution control programs were projected, but some were doubtful as to their realization and effectiveness. Perhaps by 1980, the pollution will decrease to the 1940 level. Fear was felt for the future when natural gas will be obliged to change to heavy oil. In Japan, mass transport systems should be revaluated from the standpoint of the pollution problem in urban areas during rush hour.

32008 **APTIC NO. 55299**

Koehnlein, Wilhelm

CURRENT TASKS OF THE TECHNICAL INSPECTION ASSOCIATIONS. *(Aktuelle Aufgaben der Technischen Ueberwachung). Text in German. Umschau (Berlin), 73(20):619-623. 7 refs.*

The Technical Inspection Association (TUV) has been asked to work out emission inventories for Mannheim/Ludwigshafen, Duisburg, and Cologne. The emission inventory for Cologne offers interesting aspects, although it is not completed yet. Industries emit primarily (43%) oxides of sulfur, 19% oxides of nitrogen, 29% organic gases and vapors, while traffic and domestic heaters emit primarily CO (91%) and 73%. For finding these percentages, extensive investigations were necessary. For the industries the data from 575 large complexes were used. The TUV also studied forklift truck safety, a cardiovascular test for occupational medicine, and emission maps to control the sources and spread of pollution.

32009 **APTIC NO. 54336**

Koshimizu, Toshiko, Kazuyuki Takamatsu, Yutaro Sekiguchi, Shigeru Hashimoto, Mikihiro Kaneko, Yoshio Saiki, Shozo Fukui, and Saburo Kanno

STUDIES ON THE PRACTICAL APPLICATION OF AN ION ELECTRODE METHOD (4): THE CONCENTRATIONS OF CYANIDE IN AUTOMOBILE EXHAUST GAS, COMBUSTION STACK GAS AND ENVIRONMENTAL AREA. *(Ion denkyokyho no jitsuyoka ni kansuru kenkyu (daiyonpo) (Jidosha haishutsu gasu, nensho haigasu oyobi seikatsu kankyoshu no shian nodo)). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 12(4):254-260, Aug. 1973. 2 refs.*

Automobiles and incineration plants generate hydrogen cyanide in concentrations of 2.6 to 18.0 mg/cu m. These concentrations are increased by high speeds and adjustment of high carbon monoxide concentrations in automobiles; in incineration plants, the hydrogen cyanide concentration is increased by imperfect combustion conditions. However, the concentrations of hydrogen cyanide in the atmosphere over areas such as heavy traffic roads are less than 0.005 mg/cu m. Thus the hydrogen cyanide pollution caused by automobiles is not considered significant.

32010 **APTIC NO. 54190**

Kurose, Shozo

AN INVESTIGATION ON THE ACTUAL CONDITIONS OF FOUNDRIES IN OSAKA CITY -- FOUNDRIES AND POLLUTION (4). *(Osakafu-ka chuzo kojo no jittai chosa -- chuso kojo to kogai (4)). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(9):643-650, Sept. 1973.*

The emissions from the dust collection methods for foundries in Osaka are discussed. In a cupola furnace, a forced ventilation of 18 to 22 cu m/min/ton is used by an air blower of 10 hp/ton for mixing and burning the raw metal and coal, so that a very large amount of dust is produced compared to dust emitted from heavy oil, city gas, and reverberatory furnaces. The dust emission standard is 0.2-0.4 g/N cu m and the sulfur oxides standard is based on the equation q equals K times .001 He squared.

32011 **APTIC NO. 55271**

Lee, Robert E., Jr. and Darryl J. von Lehmden

TRACE METAL POLLUTION IN THE ENVIRONMENT. *J. Air Pollution Control Assoc., 23(10):853-857, Oct. 1973. 12 refs.*

Trace metal pollution in the environment is discussed in terms of major sources, atmospheric measurements, and research needs. Airborne metals found in concentrations greater than 1 microgram/cu m include iron, lead, zinc, and magnesium, all of which are present in sizeable quantities in emission particulates from coal fired power plants, iron and steel foundries, brass/bronze refineries, and in other sources. The particle size of trace metals give some indication of the source. Metals associated mainly with inorganic salts in coal and industrial materials are not as volatile as organically associated metals during combustion. Several metals in urban air, including lead and vanadium, are associated with particles in the predominantly submicron diameter range thereby presenting an inhalation threat. Some metals emitted from stationary sources are concentrated in submicron sized particles which may pass through emission control devices. Data on the identification and concentration of metal components as a function of size is critically needed both for emission sources and for ambient air. Particle size data on trace metals can be used to appraise the efficiency of emission control devices, to evaluate the inhalation hazard, to aid in understanding atmospheric transformations, to determine the residence time of metals in the atmosphere, to assess visibility reduction, and for a wide range of other applications. There is also a need to evaluate and develop improved chemical analytical methods in the parts per billion range. Showing greatest promise are neutron activation, spark source mass spectrometry, anodic stripping voltammetry, x-ray fluorescence, and atomic absorption. (Author abstract modified)

32012 **APTIC NO. 54633**

Lowes, T. M. and M. P. Heap

THE EMISSION OF OXIDES OF NITROGEN FROM NATURAL GAS AND PULVERISED FUEL FLAMES. *Riv. Combust. (Milan), 27(4-5):256-270, April-May 1973. 12 refs.*

Burner and furnace design criteria for minimizing the emission of nitric oxide from industrial turbulent diffusions was investigated in a series of trials. Burner situations that allowed good mixing between the primary and secondary flows before combustion produced high NO emissions. This situation can occur for flames stable on the burner if a Type II flow exists, or when the flame front is remote from the burner if adequate entrainment of the secondary flows has occurred. Burner situations which have enough swirl to produce coal jet instabilities can result in low NO emission. These flames are not stable on the burner and can produce pressure fluctuation within a combustion chamber. A low NO emission can be obtained from a flame stable on the injector, providing the flow situation does not occur which gives good mixing between the primary and secondary flows. The optimization is not yet possible. The principles for a pulverized coal burner design need further development due to the limited range of the experimental information on the variation of NO emission with primary air percentage. No mathematical modeling technique can be used to predict the NO emission levels from natural gas or pulverized coal flames. Correlation models could be developed based on experimental results, which indicate emission trends with burner parameters. (Author conclusions modified)

32013 **APTIC NO. 54264**

Lyon, W. S., L. C. Bate, F. F. Dyer, J. S. Eldridge, J. F. Emery, S. A. Reynolds, E. Ricci, J. E. Strain, H. E. Zittel, C. Feldman, and K. J. Northcutt

TRACE ELEMENT PROFILES THROUGH A COAL-FIRED STEAM PLANT. *In: Analytical Chemistry Division Annual Progress Report for Period Ending September 30, 1972. Oak Ridge National Lab., Oak Ridge, Tenn., Analytical Chemistry Div., Atomic Energy Commission Contract W-7405-eng-26, UC-4--Chemistry, p. 30-31, Jan. 1973.*

NTIS: ORNL-4838

Toxic trace elements in the influent and effluent materials of a selected TVA coal-fired power plant were followed through the fuel plant to determine in what part of the waste system they finally stop. Samples were gathered from the air heater, inlet air, precipitator inlet, precipitator outlet, and the stack. Solid samples were coal prior to burning and bottom ash after combustion. The total cu ft/min of air through the stack was measured, as was the total weight of coal burned per minute. Data were accumulated on three complete runs by use of nondestructive neutron activation analysis. Mercury has been determined on all samples by flameless atomic absorption. A number of samples have also been analyzed by spark source mass spectrometry. A table lists the resulting amounts of trace element contents in coal, slag, and fly ash.

32014 **APTIC NO. 54947**

Marchionna, Nicholas R., Larry A. Diehl, and Arthur M. Trout

EFFECT OF INLET-AIR HUMIDITY, TEMPERATURE, PRESSURE, AND REFERENCE MACH NUMBER ON THE FORMATION OF OXIDES OF NITROGEN IN A GAS TURBINE COMBUSTOR. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TND-7396, Rep. E-7465, Work Unit 501-24, 33p., Oct. 1973. 13 refs.*

NTIS:

The effect of inlet-air humidity on the formation of oxides of nitrogen from a gas turbine combustor was investigated. Combustor inlet-air temperature ranged from 506 K (450 F) to 838 K (1050 F). The tests were primarily run at a constant pressure of 6 atm and reference Mach number of 0.065. The NOx emission index decreased with increasing inlet-air humidity at a constant exponential rate: NOx equals NO sub x sub o e to the -19th power (where H is the humidity and the subscript o denotes the value at zero humidity). The emission index increased exponentially with increasing normalized inlet-air temperature to the 1.14 power. Additional tests made to determine the effect of pressure and reference Mach number on NOx showed that the NOx emission index varies directly with pressure to the 0.5 power and inversely with reference Mach number. (Author abstract)

32015 **APTIC NO. 54632**

Marcoaldi, C. A. and P. Toni

APPROACH TO THE CONTROL OF GASEOUS POLLUTANT EMISSION FROM COMBUSTION PROCESS BY MEANS OF AN ON-LINE PROCESS COMPUTER. *Riv. Combust. (Milan), 27(4-5):278-284, April-May 1973. 11 refs. (Presented at Italian Flame Day, Pisa, Italy, March 20-21, 1973.)*

An approach to optimization of nitrogen oxides emission in a furnace is treated on the basis of measurements made in a nonconventional pilot plant. The problem was studied as the first step in a long term research on the optimum control of a power plant operating under the supervision and control of a digital process computer in order to find out the optimal operative conditions of mixing, air excess, and temperature distribution to minimize pollutant emission. A computer program was developed to predict nitrogen oxide and sulfur oxide concentrations using, as a kinetic model of their formation, the Zeldovich chain mechanism, to which three reactions were added to take into account the formation of sulfur oxides. A second computer program was used to study the nonsteady state thermic behavior of the furnace. The experimental results are in accordance with the assumed mathematical mode. (Author abstract modified)

32016 **APTIC NO. 54425**

Meszaros, Lajos

EMISSION STUDIES IN NON-CONTINUOUS CHEMICAL TECHNOLOGIES. *(Emisszio-vizagalatok nem folyamatos vegyipari technologiakban). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):229-231, 1973. 6 refs.*

Thesis for the mathematical determination of a confidence interval for a parameter of the distribution function of the intense emission concentrations in non-continuous chemical technologies, and even in cases of non-Markov-type emission processes, is presented. The new terms of intense, extensive, and emission modes are introduced. The intense emission mode represents the total emission during acturl operating periods, while extensive emission mode means global emission during the entire non-continuous chemical process. The most frequently occurring emission concentration in the samples is termed as emission mode. The emission median is usually located between the emission mean and the emission modex values.

32017 **APTIC NO. 54971**

Naumann, Robert J.

SMOKING AND AIR POLLUTION STANDARDS. *Science, 182(4110):334-335, Oct. 1973. 4 refs.*

The carbon monoxide content of a single puff (34.1 cc) of cigarette smoke is 1.626 mg. An average smoker who takes eight puffs per cigarette and who smokes 20 cigarettes in a 16 hr period, inhales 260 mg of CO. An average person inhales 10 cm of air per day. This air would have to contain 39 mg of CO/cm or 33.6 ppm for an average person to receive an equivalent dose of CO in 16 hrs. A CO concentration of 30 ppm averaged over an 8 hr period is defined as an air pollution warning situation according to the National Ambient Air Quality Standards. One package of regular cigarettes produces 460 mg of tar particulates. A cigarette smoked in 4 min will raise the count of tar particulates to 2700 micrograms/cu m, 36 times the level considered safe according to the clean air standards. It appears impossible to maintain clean air standards in the presence of smokers, and the use of tobacco must be controlled as well as automotive and industrial sources.

32018 **APTIC NO. 54588**

Neumann, Hans Joachim and Hans-Henning Oelert

ENGINE FUELS - DEVELOPMENT AND ENVIRONMENTAL PROBLEMS. *(Kraftstoffe - Entwicklung und Umweltprobleme). Text in German. Chemiker-Ztg. (Heidelberg), 97(9):453-461, Sept. 1973. 30 refs.*

Engine fuels serve for the operation of spark-ignition, diesel, and jet engines. The demands placed on fuels for these engines and the production of fuels are discussed. Fuels for Otto engines (spark-ignition) must have high anti-knocking properties, a sulfur content which should not exceed a value of 0.1% by weight, and may not resinfy during storage. The minimum requirements for Otto fuels are laid down in German regulation DIN 51600. Diesel fuels must ignite readily. They are mixtures of hydrocarbons boiling between 170 and 370 C. Fuels are produced from crude oil which are separated into fractions by distillation. In the simplest case a fuel can be obtained through further separation. Frequently cleaning operations are required. The required desulfurization is achieved through catalytic hydration for which mixed catalysts are used consisting of the sulfides of cobalt, molybdenum, and/or nickel or an acid silicatic carrier material. Of the pollutants emitted by gasoline driven combustion engines, the S emission is negligible. The carbon monoxide emission does not directly depend on the fuel composition, the emission of oxides of nitrogen is clearly influenced by engine conditions. Thus the question remains to what extent the HC emission is influenced by HC composition of the fuel. As recent studies have shown, the emission of polycyclic aromatic hydrocarbons depends primarily on the concentration of these substances in the fuel. However, this question is still very much in the investigation stage.

32019 **APTIC NO. 54484**

Reifenhaeuser, R.

EXPERIENCE WITH OIL-FIRED UNITS IN THE POWER PLANT IRSCHING. *(Erfahrungen mit oelgefeuerten Blockanlagen im Kraftwerk Irsching). Text in German. VGB Kraftwerkstechnik, 53(9):594- 603, Sept. 1973.*

The two oil-fired steam generators of a power plant were taken into operation in spring of 1969 and the summer of 1972. The first generator had a capacity of 150 MW, the second a capacity of 330 MW. They were supplied with heavy fuel oil from a refinery 500 m away. The sulfur concentration in the fuel could have a maximum allowable concentration of 2%. A detailed description of the oil firing system and the regulation system of the two units is given. In the 150 MW unit the dust concentration in the flue gas, the sulfur dioxide and trioxide concentrations, the acid dew point, and the film forming rate were measured after 18,000 operating hours. The isokinetically sampled flue gas was passed through a cyclone with high speed. The dust particles larger than 5 micron were separated. The collection efficiency was between 90 and 95%. The film forming rate was measured with the Degussa unit at a voltage of 12 V, the acid dew point was measured with the same unit at a voltage of 100 V. With sufficient air surplus, the dust emission was low, the SO3 fraction was higher because of the higher oxygen quantity available. With near stoichiometric combustion, the SO3 concentration dropped and the solid concentration rose. With low oil pressure, the droplets were not so fine they were not burned completely, and the solids fraction increased.

32020 **APTIC NO. 54967**

Saito, Keizo and Shigeru Yanagihara

THEORETICAL STUDY OF NITRIC OXIDE FORMATION IN SPARK IGNITION ENGINES. *(Hibana tenka kikan ni okeru NO seisei no keisan). Text in Japanese. Kikai Gijutsu Kenkyusho Shoho (J. Mech. Eng. Lab.), 27(4):121-136, July 1973. 7 refs.*

A theoretical study of nitric oxide formation in spark ignition engines is presented. The effects of engine operating variables to NO formation were investigated according to Lavoie s and/or Starkman s method, and air fuel ratio, engine speed, compression ratio, the ratio of exhaust gas recirculation, rate constants of reactions and burned gas temperature were calculated. The indicated mean effective pressure from the calculated cylinder pressure was computed. Most of the NO is produced in early burned gas, which reaches very high temperatures by the adiabatic compression of subsequent combustion. Reduction in NO level may be achieved by lowering the peak temperature of the early burned gas in the cylinder. Retarding the ignition timing at lean operation or exhaust gas recirculation at rich operation is an effective method of reducing NO concentration in exhaust gas.

32021 **APTIC NO. 54622**

Schneider, Werner

REFUSE INCINERATOR FLUE GAS-INFLICTED CORROSION AND EMISSION DAMAGES. *(Korrosionen und Immissionsschaeden durch Muellrauchgase). Text in German. Energietechnik, 23(6):277-280, June 1973. 31 refs.*

General problems of corrosion and plant (flora) damage due to refuse incinerator-generated flue gases are described. Corrosion occurring at temperatures above 400 C is due to a combination of hydrochloric acid as formed during the incineration of polyvinyl chloride and common salt with reducing atmosphere in overheater and steam generator zones of refuse incinerators. Quantitative volatilization of the iron chloride formed on metal surfaces above 400 C was observed. High-temperature corrosion can be avoided or reduced by feeding homogenized batches, the use of secondary air, and by limiting the steam temperature to 250-300 C. Corrosion at temperatures around 200 C is due to the formation of low-melting, hygroscopic hydrates of zonc and iron chlorides which predominantly precipitate in electrostatic dust separators. Watery condensates, containing HCl, sulfur dioxide, and sulfur trioxide, can cause low-temperature corrosion in small-capacity incinerators with wet type dust separation. Odorous emissions from incinerators can be avoided by the application of temperatures above 800 C, and combustion air intake from refuse bunkers. The SO2 emission concentrations from refuse incineration plants range from 0.5 to 1.0 g/N cu m. The HCl concentrations, being in the same range, are much more critical, and can easily cause plant damages around waste incineration plants. The HCl concentrations can be reduced by proper siting of the incinerators, and proper choice of the stack height. No phosgene is formed during waste incineration processes, while the hydrofluoric acid concentrations may reach up to 10 mg/N cu m.

32022 **APTIC NO. 54769**

Sirignano, W. A.

ONE-DIMENSIONAL ANALYSIS OF COMBUSTION IN A SPARK-IGNITION ENGINE. *Combust. Sci. Technol., 7(3):99-108, 1973. 6 refs.*

A theory based upon a concept of turbulent flame propagation has been developed and has resulted in the calculation of pressure versus crank angle and temperature versus both crank angle and chamber position as a function of various design parameters. These parameters include the rpm, mixture ratio, spark advance, compression ratio, and displacement. It is possible to use the temperature and pressure results to calculate the concentration of nitric oxide as a function of crank angle and chamber position. In particular, the concentration of NO in the emissions could be calculated. Turbulent mixing occurs to a significant extent throughout the chamber, especially for larger turbulent eddy sizes. After burning is completed, the mixing tends to uniformize the temperature distribution somewhat. (Author abstract modified)

32023 **APTIC NO. 54624**

Tuttle, J. H., R. A. Altenkirch, and A. M. Mellor

EMISSIONS FROM AND WITHIN AN ALLISON J-33 COMBUSTOR II: THE EFFECT OF INLET AIR TEMPERATURE. *Combust. Sci. Technol., 7(3): 125-134, 1973. 10 refs.*

A model of the flow pattern within an Allison J-33 combustor (a gas turbine) using unheated inlet air was previously postulated, based on internal measurements. Additional data consistent with the postulated flow model were obtained from the same combustor using heated inlet air at near design conditions. In addition to the results of the first work, it was found that hydrocarbon concentrations follow carbon monoxide concentrations in the various regions within the combustor and, in particular, are quenched in the centerline recirculation zone. Also, there is a corner recirculation zone between the dome and the fuel spray cone. Since the injector is surrounded by an air swirler, this region has fuel lean zones, and nitric oxide formation occurs here. However, the formation of NO in the corner recirculation zone accounts for only 7.5% of the total NO eimssions. In going from unheated to heated inlet air, no major changes in the qualitative flow pattern were observed. Both internal and exit plan measurements disclosed the importance of heterogeneous effects throughout the primary zone of the J-33 combustor. The low gas temperatures measured within the primary zone of the combustor are attributed to the direct impingement of liquid fuel drops upon the thermocouple junction. Exit plane emissions trends could only be explained consistently if injector performance were considered. In general, as the overall combustor equivalence ratio increased, the CO, HC, and NO decreased. Both CO and HC concentrations decreased with increasing air inlet temperature, while NO increased, then decreased. (Author summary modified)

32024 **APTIC NO. 55025**

Weisfeld, Lewis B.

PLASTICS ADDITIVES AND THE ENVIRONMENT. I: CADMIUM AND LEAD STABILIZERS. *Preprint, Cincinnati Milacron Chemicals, Inc., New Brunswick, N. J., 8p., 1973. 35 refs.*

The environmental effects of cadmium and lead stabilizers used in the plastics industry are discussed. The bulk of evidence indicates that the use of cadmium and lead in vinyl stabilization poses an insignificant threat to the environment. Even with the incineration of cadmium containing polyvinyl chloride discards (nonpackaging use), total environmental emissions from this industrial sector into the atmosphere, water supply, or food are inconsequential. However, in view of the great focus of public attention on heavy metals and the environment, the possibility of broad and prohibitive legislation cannot be precluded. This has already happened in the paint industry. In the event of such, cadmium can be replaced in vinyl stabilization applications, but prohibition of lead will work severe hardships on the wire and cable industry in particular, and on the electrical industries in general. (Author summary modified)

32025 **APTIC NO. 54610**

Welzel, Klaus, Hans-Dieter Winkler, and Klaus Muckhoff

DUST EMISSIONS FROM THE MELTING OF PIG IRON IN A FIVE TON FIFTY HERZ CRUCIBLE INDUCTION FURNACE. *(Staubemission eines 5-t-Netzfrequenz-Induktionstiegelofens beim Schmelzen von Gusseisen). Text in German. Giesserei (Duesseldorf), 60(19):603-607, 1973. 3 refs.*

The dust emission from a 5-ton 50-herz crucible induction furnace with a capacity of 1450 kVA was determined. In the furnace pig iron was molten with spherical graphite. As a raw material, old rails and sheet steel packages were used. The furnace was loaded manually or with a bucket charger. The emissions leaving the crucible furnace with a closed lid were drawn off with a lid-ring-exhauster, additionally an exhaust hood over the crucible drew off the residual dust and smoke. The dust concentration was determined according to the VDI guideline 2066 by isokinetic sampling. The dust particles were separated by a glass fiber filter. Based on the measurements, the dust emission per ton of iron amounted to about 300 to 350 g. The type of raw material had considerable influence on the dust emission. The measurements will be continued with other furnaces and continuous dust measuring units.

1972

32026 **APTIC NO. 54698**

Washington State Dept. of Highways

FINAL ENVIRONMENTAL IMPACT STATEMENT: ADMINISTRATIVE ACTION FOR SR 90, LOWER CROSSING SNOQUALMIE RIVER TO NATIONAL FOREST BOUNDARY IN KING COUNTY. *84p., Feb. 1, 1972.*

NTIS: PB 204167 F

The reconstruction of State Route 90 to six lanes with fully controlled limited access from the Lower Crossing of the Snoqualmie National Forest Boundary, a distance of 4.06 mi in King County, Washington, is planned on a new alignment generally on the north side of the river. State Route 90 is a major transcontinental route and is the only Interstate portion of the cross-mountain highway linking Washington s major population centers. This highway serves a major portion of the state s annual 10.1 million visitors, together with intrastate and interstate commercial truck traffic. Inasmuch as there are no public parks or recreation areas within the limits of this project, the Department of Highways feels no lands as described in section 4(f) of the U. S. Department of Transporation Act of 1966 are involved. This project will provide a smoother and safer traffic flow and improved recreational access at the expense of disruption of the river, adjacent lands, and their inhabitants. Three possible alternatives are discussed and include a southside alignment which utilizes the existing highway s right of way to the greatest extent possible; a split alignment similar to the southside alignment, except that portions of the alignment are on either side of the river; and northside alignments, which are located north of the river. The highway is designed to minimize air pollution from motor vehicle exhausts. (Author summary modified)

32027 **APTIC NO. 54748**

Florida Dept. of Transportation

FINAL ENVIRONMENTAL/SECTION 4(2) STATEMENT. ADMINISTRATIVE ACTION FOR STATE JOB NO. 15190-3422, FEDERAL JOB NO. I-75-1(42)448, INTERSTATE ROUTE 75, PINELLAS COUNTY, FLORIDA. *108p., Jan. 13, 1972.*

NTIS: PB 204376-F

An ecological impact statement is given for construction of a multi-lane, limited-access interstate highway and its related facilities in the city of St. Petersburg. It will begin 950 ft north of the north toll plaza on the Sunshine Skyway, thence northerly for 1.98 mi to a terminus at 39th Avenue, South. The ecological impacts of this project will be minimal. There will be some impact on the human environment as the project relates to the extraction of land from its present use, the temporary disruption of a public park, the dislocation of families and businesses, adverse aesthetic effects of elevated roadway fill sections, restriction of east-west movement to grade separations and interchange locations, an unavoidable slight increase in atmospheric and noise pollution, increase in safety, convenience, and efficiency for both local and through traffic, and relief of congestion along parallel roadways. (Author summary modified)

32028 **APTIC NO. 54773**

DISPOSAL OF BULKY SOLID WASTES. *J. Air Pollution Control Assoc., 22(11):868-864, Nov. 1972. 24 refs.*

Methods for the disposal of bulky solid wastes are discussed. Pretreatment of bulky wastes may be preliminary to further processing for the reduction, conversion, recycling, or elimination of these wastes, or a process to facilitate final disposal, as by sanitary landfill. Pretreatment is intended to segregate similar wastes thrdugh a sorting process, to reduce size, or to change the structure of one or more components. With the exception of hand sorting, all pretreatment processes involve the application of mechanical energy with the probably production of noise and dust. Control of these environmental hazards involves additional costs. The most commonly used means of disposing of bulky wastes is dumping which is unsanitary, hazardous, and creates a very unsightly appearance. Bulky wastes should be reduced in size by shredding, shearing, or by compaction to conserve space. Bulky wastes are forced into the landfill by the machine used to spread and compact all the refuse. The volume of separately collected household appliances can be reduced to approximately 30% of original volume when compacted on relatively firm ground. The present quantity of wastes barged to sea is approximately 48 million tons/yr. Special purpose refractory line furnaces have been designed for the incineration of combustible solids. The teepee burners are banned by the air pollution control authorities. Open pit incinerators in order to conform to current emission regulations and air quality standards must operate at such low throughputs as to make them uneconomical. Open barge burning at sea is unsatisfactory because of on shore air pollution.

32029 **APTIC NO. 54788**

Atomic Energy Commission, Washington, D. C., Div. of Radiological and Environmental Protection

ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF OCONEE NUCLEAR STATION UNITS 1, 2 AND 3. (FINAL REPORT). *Docket No. 50-269, 50-270, 50-287 (EIS), 383p., March 27, 1972. 189 refs.*

NTIS: PB 204910-F

An environmental impact statement is made concerning the Oconee Nuclear Station in South Carolina, county of Oconee, near the city of Seneca. The Oconee Station is integrated into the Keowee-Toxaway Project in an arrangement that provides water for condenser cooling as well as hydroelectric power for peaking purposes. The Oconee Nuclear Station will have three units, each with a pressurized water reactor having an electrical output of about 922 megawatts and a waste heat generation of about 1650 megawatts. Descriptions of the site; the plant itself; environmental impacts of site preparation, plant construction, and plant operation; biological impacts; radiological impacts; environmental impacts of postulated accidents; unavoidable adverse effects; irreversible commitments of resources; the relationship between short-term uses of the environment and long- term productivity; alternatives to this proposal; and a cost benefit analysis are discussed. Effects on air pollution include the dispersion of gaseous effluents. Average annual concentrations of radionuclides contained in the air and deposited on the ground at distances up to 50 mi from the plant have been estimated. The deposition velocities used in the calculations were 10 to the -6th power cm/sec for the noble gases, 10 to the -6th power cm/sec for methyl iodide, and 1 cm/sec for molecular iodine and particulate matter. Air will be used for the dilution of gases from operation of a small boiler fired with fuel oil, and operation of the nuclear plant. Some localized increase in fog may result from the increased surface temperature of the reservior, but this will not affect areas a few miles away.

32030 **APTIC NO. 55076**

Dow Chemical U.S.A. Midland, Mich., Inorganic Chemicals Dept.

DOW CHLORINATED SOLVENTS AND THE CLEAN AIR ACT. *10p., 1972.*

The relationship between the national air quality standards and the chlorinated solvents manufactured by Dow Chemical U.S.A. are discussed. The Clean Air Act and its amendments of 1970 are aimed at establishing ambient air quality standards to force evaluation of programs to reduce air pollution. Pollutants affected include sulfur oxides, particulate matter, carbon monoxide, hydrocarbons, photochemical oxidants, and nitrogen oxides. The chlorinated solvents are hydrocarbons. Their presence with NOx and sunlight form photochemical oxidants which is the basis for control of hydrocarbon emissions. Photochemical oxidants contribute to smog formation. National primary and secondary photochemical oxidant standards may be accomplished by controlling the emissions of organic compounds to less than 3 lb/hr up to 15 hr maximum/day from any piece of equipment. The regulations require that emissions in excess of these quantities be reduced by at least 85%. Tichloroethylene is the only common chlorinated solvent regulated. Chlorinated solvents which do not form oxidants and are exempt are chlorothene solvents, perchloroethylene, and methylene chloride.

32031 **APTIC NO. 55170**

Dept. of Interior, Washington, D. C., Bureau of Reclamation

FINAL ENVIRONMENTAL STATEMENT, NAVAJO PROJECT. *FES 72-1, 238p., Feb. 4, 1972.*

NTIS: PB 203228-F

The Navajo Generating Station near Page, Arizona, consists of three units, each with an estimated net output of 770,000 kw. The generation station will burn coal in order to provide electricity for the Central Arizona Projects. Stack emissions from the generating station are estimated to be 210 tons of sulfur dioxide and 204 tons nitrogen oxides per day, without the use of control equipment. The participants in the project are committed to install SO2 removal systems on all three units of the generating system as State and Federal standards are adopted. To remove NOx from flue gases of the coal-fired generating plants, the participants have incorporated boiler modifications which will permit combustion modifications. Disposal of an estimated 1815 tons/day of ash produced from the burning of 23,000 tons/day of coal at full load will be required. The coal has an ash content ranging from 5.84-12.18% by weight. The ash will be transported to a box canyon 2 miles from the generating station site where it will be deposited and stabilized. There may be vapor plumes from the stacks under certain meteorological conditions. There will be dust from coal and ash handling at the generating station, at the coal mining operation, and in the loading and transportation of the coal. The best modern technology will be used to prevent dust hazard or nuisance. The possibility of small amounts of trace elements in the flue gases are not anticipated to be an environmental hazard.

32032 **APTIC NO. 55185**

International Business Machines Corp., Gaithersburg, Md., Federal Systems Div.

NEW YORK, WISCONSIN AND VIRGINIA POINT SOURCE EMISSION INVENTORY. (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0043, Task 13, APTD-1559, 15p., June 1972.*

NTIS: PB 222835

Point source emission inventories were developed for the States of Virginia, Wisconsin, and New York to review, correct, and complete NEDS data forms for each state. NEDS Point Source Input forms were completed for all emission points identified as meeting the EPA criteria for inclusion in the States of Virginia and Wisconsin. Seventy nine NEDS Point Source Input forms were completed for power plants in New York as derived for FPC 67 forms provided by EPA. The basic assumptions used in conjunction with the study are reviewed, along with the approach used and the general accomplishments and results.

32033 **APTIC NO. 54892**

Abe, Koji, Hidehiko Hoshikawa, and Toshihiko Seki

THE AMOUNT OF SULFUR IN HEAVY OIL USED IN THE MAIN BUSINESS PLACES IN SENDAI CITY. *(Sendai shinai no shuyo jigyosho de shiyo shiteiru juyuchu no io ganryo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health, no. 3:194-195, March 1972. 2 refs.*

The amount of sulfur in heavy oil used in the boilers of the main business offices and factories of Sendai was measured by means of an analyzer using radioisotopes. The sulfur content of heavy oil is measured from the degree of absorption of the gamma rays emitted from a radioactive isotope. Forty-nine of 121 business places having a heat transmitting area of more than 10 sq m of boiler in the fuel regulated area were investigated. The amount of sulfur in heavy oil was in the range of 0.55 to 0.83%, and both the arithmatic mean and the central value were 0.76%. The standard was exceeded in only one establishment.

32034 **APTIC NO. 54665**

Caulfield, T. O., J. A. Caton, P. J. Pagni, and D. Gilson

LEAD ADDITIVE EFFECTS ON PARTICULATE EMISSIONS FROM A C.F.R. ENGINE. *California Univ., Berkeley, Mechanical Engineering Dept., WSCI 72-42, Rept. ME-72-12, 19p., Oct. 1972. 23 refs.*

Measurements were made of an engine s particulate emission mass, size distribution, and composition as a function of tetraethyl lead (TEL) motor mix additive concentrations. Three methods were used to simultaneously determine the particle size distribution: A Royco particle counter; particle counting on electron micrographs; and a laser aerosol monitor. Experiments with this laser system using a monodisperse aerosol of commercially available latex particles indicate an accuracy of approximately 10% for aerosols with a known index of refraction. Mass emission measurements indicate that 4 g/gal of TEL motor mix additive in iso-octane will increase the mass of particulate emissions by an order of magnitude over a wide range of operating conditions. Particle size distribution measurements indicate the emission of many more small (less than 0.1 micron) particles when the tetraethyl lead motor mix additive is used. (Author abstract)

32035 **APTIC NO. 55169**

Farouq Ali, S. M.

A CURRENT APPRAISAL OF IN-SITU COMBUSTION FIELD TESTS. *J. Petrol. Technol., 24:477-486, April 1972. 69 refs. (Presented at the Society of Petroleum Engineers, Rocky Mountain Regional Meeting, Billings, Mont., June 2-4, 1971.)*

Two dozen forward combustion tests out of approximately 100 cited in the literature are presented, compared, and contrasted with the contention that when properly engineered they can recover 50% of oil in place. Tabular data are presented for pay, depth, porosity, permeability, reservoir temperature and pressure, oil saturation, water saturation, API gravity, oil viscosity, test pattern type, acres, primary recovery, average air injection rate, average injection pressure, oil production rate increase, air requirement, air-oil ratio, oxygen utilization efficiency, fuel content, and combustion zone velocity for 24 selected firefloods. The combustion-zone velocity of these technical successes ranged from 0.08 to 1 ft/D, the usual case being a few inches per day. Peak temperatures ranged from 1000 to 1500 F, and heat losses were considered to be small. Heat generation in the reservoir depended upon the fuel content of the rock-fluid system and the heating process involved. The produced gases contained nitrogen, carbon dioxide, any unreacted oxygen, and possibly carbon monoxide as well as traces of other gases such as hydrogen sulfide. The gas recovery in most cases was over 80%. Gas treaters are recommended for completely oxidizing produced gases that contain carbon monoxide and hydrogen sulfide. The data indicate that in-situ combustion is feasible under a wide variety of field conditions; and next to waterflooding, this process could become the most widely used recovery method.

32036 **APTIC NO. 55107**

Hescheles, Charles A. and Sydney L. Zeid

INVESTIGATION OF THREE SYSTEMS TO DRY AND INCINERATE SLUDGE. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 265-280. (June 4-7.)*

A survey was made of fluidized beds. Herreshoff multiple hearths, and rotary kilns in order to evaluate their performance in drying and burning industrial sludge. The fluidized bed system has a high capital and operating cost that cannot be justified at the present time; the system also retains unresolved operating and maintenance problems. Capital investment and annual operating cost differences between the multiple hearth and rotary kiln were small enough to dictate selection based on performance and maintenance. The two-rotary kiln system is more versatile than the multiple hearth system. The former has independent temperature controls for the dryer temperature and the incinerator furnace temperature, whereas the multiple hearth is one entity, not having the same flexibility. The rotary kiln had a few more units which require maintenance, but this by itself should not be a deterent in view of the advantages accrued in the operation. This method has good control over the emission of odors, stack gases, steam plumes, and thermal pollution.

32037 **APTIC NO. 54715**

Kloke, A.

CADMIUM IN THE ENVIRONMENT. *In: Report on Third Technical Meeting on Occurrence and Significance of Chemicals in the Environment, Berlin (West), 17th-20th January 1972. Organisation for Economic Co-operation and Development, Paris (France), p. 25-31, 1972. 28 refs.*

The cadmium content of the soil is being increased from a variety of different sources, and this is followed by a corresponding increase in the cadmium content of plants. In general, zinc and cadmium contaminate the water where these chemicals are used in technical processes. The atmosphere is polluted with these metals following the burning of paper, synthetic materials, coal, domestic heating, and diesel oil which has led to the enrichment of soils and plants along the sides of motorways. Following the application of phosphate fertilizers, cadmium can be deposited in small amounts in the soil. Although local applications of pesticides containing cadmium lead to very low levels of environmental contamination, the Federal Republic of Germany has banned the use of pesticides containing this metal. In that cadmium is as poisonous as mercury, the maximum safe air concentration for cadmium in work places is 0.1 mg/cu m air. More attention should be paid to this element. (Author summary modified)

32038 **APTIC NO. 54435**

Liao, Bao-Ho (Paul)

DESIGN METHOD FOR FLUIDIZED BED SEWAGE SLUDGE INCINERATORS. *Washington Univ., Seattle, Dept. of Sanitary and Municipal Engineering, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 152p. 95 refs.*

Design equations were developed for a sludge fluidized bed incinerator which will satisfactorily incinerate sewage sludge into a completely non-pathogenic solid residue with a minimum effect on environmental quality. Complete sewage sludge combustion in a fluidized bed reactor depends on oxygen, temperature, and time. To assure complete incineration, temperature should be maintained above 1200 F, at least 4% excess O2 should be provided, and the retention capacity of a fluidized bed reactor can be as high as 50,000 Btu/cu ft/hr or 300,000 Btu/sq ft/hr. The orifice air velocity for supporting good fluidation should be adequate to provide a drag force about eight times higher than the individual weight of sand granules. Sludge loading rates are inversely proportional to the sludge moisture contents. Burning liquid sludge in a fluidized bed incinerator is feasible. No auxiliary fuel is required when sludge having moisture content of 55% or less is burned. Gaseous pollutants emitted from a fluidized bed sewage sludge incinerator are well below the Puget Sound Air Pollution Control Agency emission standards. About 5% by weight of sludge burned is emitted as particulate matter in the exhaust gases. Size distribution analysis shows that more than 95% by weight of the particles exhausted have sizes greater than 30 micron. Using the results of this research and the basic chemical equations of combustion, it is feasible to predict the quantity and quality of air pollutants emitted from a fluidized bed sludge incinerator at any specific operating condition. (Author conclusions modified)

32039 **APTIC NO. 54634**

McGarry, Frederick J. and Constantine J. Gregory

A COMPARISON OF THE SIZE DISTRIBUTION OF PARTICULATES EMITTED FROM AIR, MECHANICAL, AND STEAM ATOMIZED OIL FIRED BURNERS. *J. Air Pollution Control Assoc., 22(8):636-639, Aug. 1972. 3 refs.*

Particulate air samples were collected from the effluent gases from three steam generating boilers at an electric generating station. Samples were collected by an Andersen Stack Sampler which operates on the principle of a cascade impactor. The samples were separated into eight size ranges and were deposited on the collection plates of the sampler. These plates were weighed with the samples and compared with their tare weights to obtain the weight per plate and the total weight of particulates collected. The percent of the total weights retained on each plate was then computed for each sampling date. The plumes produced by each type of fuel atomizer were observed and compared to the results of the particulate samples. The air atomized burner produced the greatest percentage of particulates by weight in the submicron range of the three types of atomizers investigated. The air atomized unit also produced particulates with a lower combustible content than either of the other two units. The mechanical atomized burner produced particulates which were concentrated in the 9.2-3.3 micron range. The steam atomized burner produced a particulate distribution which was spread approximately through the particulate size ranges investigated. (Author summary)

32040 **APTIC NO. 55104**

Niessen, W. R. and A. F. Alsobrook

MUNICIPAL AND INDUSTRIAL REFUSE: COMPOSITIONS AND RATES. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 319-337. 13 refs. (June 4-7.)*

An estimate of the average composition of municipal solid waste has been determined by evaluation of 41 sets of composition data, and a national annual average composition is projected through the year 2000. Composition and generation rates of industrial wastes evaluated were based on data from New Jersey and New York. An indicated drop in average refuse moisture and an increase in heating value will increase incineration flue gas temperatures, and decreases in effective incinerator capacity from 250 tons/day in 1970 to only 214 tons/day by 2000 will result. A slow but steady increase in the value of volatile carbon content of refuse (19% over the 30 years) will place an increasing emphasis on obtaining satisfactory overfire air mixing and flue gas residence time prior to quenching in order to avoid increased emissions of combustible air pollutants (carbon monoxide, soot, and hydrocarbons). Methods are presented for the use of data obtained in evaluation of regional waste generation quantities. (Author abstract modified)

32041 **APTIC NO. 54454**

Nobbs, Christopher L.

MERCURY USE AND SOCIAL CHOICE. *Organisation for Economic Co-operation and Development, Paris (France), Environment Committee, 42p., May 18, 1972. 63 refs.*

The level of mercury use by society, its social cost, and the alternatives facing society in making an assessment of the likely costs and benefits of mercury in the future are discussed. The total world production of mercury exceeds 10,000 metric tons annually, of which countries belonging to the Organisation for Economic Co-operation and Development produce about 66%. Only about 20% of the mercury used is recycled; the remainder is discharged into the environment. The life process of no known living organism is directly enhanced by the presence of mercury; and at the biochemical level, all mercury can be harmful. It is as yet unknown what level of mercury within the human body will result in irreversible damage to the nervous system and/or loss of genetic integrity. The consumption of mercury at current levels is unnecessary; and the overall utilization of mercury could be substantially reduced. Direct regulation of industrial activity will be required to decrease mercury pollution in the environment. Although the problem posed by mercury pollution is only one among many, social choice regarding future use is necessary. More must be learned of the effects of mercury in the environment to aid in making an informed and constructive choice. Mercury sources and alternatives for use are described in detail.

32042 **APTIC NO. 54317**

Oka, Takeshi and Michiaki Ujihashi

THEORETICAL EXHAUST GAS COMPOSITION ON THE BASIS OF ACTUAL EXHAUST GAS COMPOSITION. *(Jikki no haiki gasu sosei o koryo shita riron haiki gasu sosei). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 11(130):11-18, Nov. 1972. 2 refs.*

A theoretical diagram of exhaust gas composition where the rate of excess air with no loss due to the passing of mixed gas is one or larger than one is described to determine theoretical exhaust gas composition. The rate of excess air, efficiency of combustion, intake efficiency, volume efficiency, scavenging efficiency, and the effect of secondary air on the exhaust gas are discussed. The engine performance could be determined on the basis of carbon dioxide plus carbon monoxide or on oxygen from a theoretical design.

32043 **APTIC NO. 55080**

Pottinger, John F.

AIR POLLUTION FROM THE WOOD CHIP INDUSTRY. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 237-240. 6 refs. (May 15-18.)*

Air pollution on a significant scale in Tasmania arises from forestry burning operations for regeneration and hazard-reduction purposes, and to a lesser extent, from bark and wood waste incineration. It is estimated that total emissions of particulates resulting from wood chip forestry burning practice will be of the order of 12,000 t/yr. Smoke emissions from hazard-reduction burns may be minimized by use of proper techniques; however emissions from such burning operations are likely to add significantly to low level smoke concentrations over a wide area. Disposal of tree bark by burning leads to significant low-level emissions of smoke due to problems presented by high moisture bark, and methods other than incineration should be employed.

32044 **APTIC NO. 54835**

Prakash, C. B. and F. E. Murray

A REVIEW OF WOOD WASTE BURNING. *Pulp Paper Mag. Can. (Quebec), 73(7):T170-T175, 1972. 34 refs.*

Wood waste burning in Canada is discussed in terms of its effects on air pollution, the efficacy of commonly used wigwam-type burners, and alternative methods of waste disposal to reduce pollution. The burning of wood can generate such pollutants as particulate matter, e.g., fly ash, fragments of incompletely burned fuel, sodium chloride, sand, gaseous products of incomplete combustion, e.g., hydrocarbons and carbon monoxide, smoke, solid particles in the gaseous products, and odors emanating from distillation or combustion products. The most common method of wood-waste disposal is the wigwam burner which has been used for many years in the lumber industries because of its economical operation. Most of these burners emit smoke and significant amounts of hydrocarbons, CO, and particulate matter to the atmosphere due to their crude design, inadequate maintenance, and poor operation. Improved performance can be achieved by operation and design modifications such as proper design of the overfire air inlet port or installation of temperature control systems. Some cleaner burning alternatives are the dutch-oven furnace which is more efficient but more expensive, the spreader-stoker type furnace which regulates ash buildup by the stoker speed, and the suspension type furnace which uses hot air to condition the feed before entering the furnace.

32045 **APTIC NO. 54721**

uinby, Griffith E.

POLYCHLOROBIPHENYLS (PCBS) AND RELATED CHLOROPHENYLS: EFFECTS ON HEALTH AND ENVIRONMENT, 1. BIBLIOGRAPHY 1881-1971. *Oak Ridge National Lab., Tenn., Toxicology Information Response Center, National Library of Medicine Interagency Agreement 40-274-71, Rept. TIRC-1, ORNL-EIS-72-20, 147p., April 1972. 870 refs.*

NTIS: PB 209944

The expanding literature on polychlorinated biphenyls (PCB) reflects the importance of these substances as environmental pollutants. The analytical confusion of PCB with DDT and other chlorinated hydrocarbon pesticides prior to 1969 is of special interest. The concern over PCBs was heightened in 1971 by the recognition of gross contamination of certain animal feeds and of trace contamination of some human foods. The articles cited in this bibliography cover the majority of articles in all languages available through Jan. 1972. (Author abstract modified)

32046 **APTIC NO. 55055**

Schoenberger, Robert J.

STUDIES OF INCINERATOR OPERATION. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 15-31. (June 4-7.)*

A series of 18 sample runs were performed at the City of Philadelphia s Northwest Incinerator while burning household refuse. The incinerator was monitored for flue gas flow rate and composition, residue quantity and chemical characteristics, and quench water composition. Temperatures were measured in both the combustion chamber and in the burning bed using specially designed probes. There are some variations in residue composition with temperature and additional testing will be needed to accurately determine the variation. (Author abstract)

32047 **APTIC NO. 54284**

Smith, Malcolm

INVESTIGATION OF PASSENGER CAR REFUELING LOSSES (FINAL REPORT). *Scott Research Labs., Inc., San Bernardino, Calif. Office of Air and Water Programs Contract CPA 22-69-68, Coordinating Research Council APRAC Proj. CAPE 9-68, SRL-2874-12-0972, Scott Proj. 2874, 14p., Sept. 1, 1972. 11 refs.*

NTIS: PB 212592

Hydrocarbon loss encountered during refueling of passenger cars was studied in order to measure one source of hydrocarbon pollutants in the air. Observation of 7151 refueling operations in a field survey demonstrated the magnitude and frequency of spill losses in a service station environment. Temperatures relevent to the estimation of displaced HC losses were also recorded. One hundred and twenty-five experiments during a laboratory study measured the magnitude of displaced losses under conditions representative of those observed in the field. Four categories of spill loss were identified as follows: prefill nozzle drill, gasoline spit-back from the fuel tank filler pipe, overflow, and postfill nozzle drip. Data was gathered from five cities during a 12 month period. Regression analyses were conducted on these data and an average composite displaced loss of 57.4 g per refueling operation was obtained. When the average displaced loss of 57.4 g per refill is divided by the average observed refill quantity, 11.5 gal per refill, an estimated displaced loss of 5.0 g per refill is obtained. The average total spill loss of 3.5 g/gal refill amounts to 0.3 g/gal. The total refueling loss for the sample data thus amounts to 5.3 g/gal of dispensed gasoline. Total refueling loss equals 0.396 g of HC/mi, which can be contrasted to the 1975-76 Federal standards for exhaust emissions which limit the unburned HC to 0.41 g/mi, and with the average value of unburned HC in the exhaust of uncontrolled vehicles of about 10 g/mi. (Author summary modified)

32048 **APTIC NO. 55145**

Stephenson, Junius W.

BURNING WET REFUSE. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 260- 264. (June 4-7.)*

Means of coping with the wet refuse problem are summarized, based on the reports from operators of 15 municipal incinerators of various types, sizes, and ages, as well as the author s conclusions. Adequate stoking is required to assume satisfactory operation with wet refuse. The amount of auxiliary fuel required and the variation in combustion air supply can not be quantified, but rather is dependent on refuse moisture content and furnace operating conditions. Continuous feed plants and plant operating 24 hr/day tend to have less severe problems with wet refuse than batch feed plants and plant operating only one or two shifts a day. Auxiliary fuel in some form is usually required to start and maintain fires with excessively wet refuse, and plants with properly sized and located auxiliary burners can maintain capacity operation and adequate temperatures under all but the most extreme wet refuse conditions. Refuse containing moderate quantities of lawn and garden wastes can be burned in a satisfactory odor and nuisance-free manner, but for refuse containing a high proportion of lawn and garden wastes, preheated combustion air, automatic control of preheat, auxiliary overfire burners, and combustion air (both underfire and overfire), and automatic control of stoker operation appear to be necessary. (Author conclusions modified)

32049 **APTIC NO. 55036**

Story, M. J.

THE REQUIREMENTS AND COSTS OF AIR POLLUTION CONTROL. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 139-145. (May 15-18.)*

Control problems associated with integrated iron and steelworks, air pollution control costs for such operations in Australia and the United States, and air pollution legislation in Australia are reviewed. The two main areas of control in integrated iron and steelworks are the coke oven batteries and sinter plants. Principal pollutants of concern are: smoke, dust, fume, sulfur dioxide, hydrogen sulfide, carbon dioxide, carbon monoxide, unburned hydrocarbons, nitrogen oxides, and fluorides. Smokeless chargers can be used for coke oven batteries, though some difficulties have been encountered with ignition. The abrasiveness of sintering operations means high maintenance and control costs associated with leakage problems and proper operation of cyclones or electrostatic precipitators. Costs for air pollution control are given for plants both in Australia and the United States. Air quality standards and criteria are defined, and the use of the latter as a control measure is discussed. An air pollution control program is suggested based upon obtaining meaningful air quality standards. Australia s air pollution legislation is critically reviewed, and a means for pursuing uniform objectives is suggested. (Author abstract modified)

32050 **APTIC NO. 54798**

Tarrant, R. F., D. G. Moore, W. B. Bollen, and B. R. Loper

DDT RESIDUES IN FOREST FLOOR AND SOIL AFTER AERIAL SPRAYING, OREGON--1965-68. *Pesticides Monitoring J., 6(1):65-72, June 1972. 44 refs.*

One month after the aerial application of DDT (12 oz/acre) to an eastern Oregon forest, 3 oz/acre of DDT residues were detected in the forest floor. Three years later, the DDT content had decreased by more than 50%, and had not leached into the surface mineral soil. At the time of spraying, water from two streams draining the sprayed area had a total DDT content of about 0.3 ppb. This low concentration decreased rapidly to levels below the limits of analytical detection. No effect of the spraying was noted on soil microbial populations, nitrification rate, or amount of nitrate nitrogen in the soil. Of the 12 oz of DDT applied per acre, about 26% reached the ground surface initially, and over 36 months, about 6% more was brought to the ground in litterfall. The DDT was also measured in precipitation. Thus, approximately one-third of the sprayed chemical reached the forest floor. The need for more efficient aerial methods of chemical application is evident. (Author abstract modified)

32051 **APTIC NO. 55146**

Theoclitus, Gregory, Han Liu, and John R. Dervay, II

CONCEPTS AND BEHAVIOR OF THE CONTROLLED AIR INCINERATOR. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 211-216. 1 ref. (June 4-7.)*

Design concepts and the behavior of a controlled air, grateless- type incinerator are presented. Such an incinerator requires a well-designed combustion chamber and an afterburner section (stack or second chamber), as well as a judicious approach to the introduction of combustion variables. The combustion of a fixed mass of waste will result in a theoretical combustion temperature which is dependent on the total air supplied for combustion under idealized adiabatic conditions and perfect mixing of air and waste. In practice, however, the maximum theoretical combustion temperature level will be substantially reduced, resulting in only partial combustion and generation of gaseous hydrocarbons. Design curves illustrating chamber behavior as a function of chamber air supplied indicate that after the total air reaches 100% stoichiometric, the intensity of the combustion process and, hence, the fly ash, can be expected to decrease. Since the gas velocities continue to increase, there should be a continual particulate carry-over from the combustion chamber. The discharged gases from the main chamber enter the afterburner section where additional air is injected, and the afterburner section functionally serves as the final combustion chamber requiring good mixing of air and gases, critical temperature, level, and sufficient retention time. Experience has shown that the optimum charging rate is in the range of more than 200% of the stoichiometric air supplied to the chamber and that a properly designed controlled air incinerator will meet the most stringent emission standards without using auxiliary air pollution control equipment.

32052 **APTIC NO. 54825**

Tsifrinovich, A. N. and N. I. Lulova

COMPOSITION OF ORGANOSULFUR TRACE IMPURITIES IN GASES. *(Issledovaniye sostava mikroprimesey seraorganicheskikh coyedineniy v gazakh). Text in Russian. Neftepererab. Neftekhim., no. 6:33-35, 1972. 2 refs.*

Organosulfur trace impurities in gases from the thermal cracking of the propane-propylene fraction and of an oil tar fraction were studied by chromatographic method. Gases from the thermal cracking of the propane-propylene fraction after concentration at -80 C and desorption at 70 C contained 7-48 mg of methyl mercaptan, 130-250 mg of ethyl mercaptan, 4.4-9 mg of carbonyl sulfide, 5.4-26 mg of carbon disulfide, 8.9-10.2 mg of dimethyl sulfide, and 16.8-27 mg of thiophene per cu m. Following cold alkaline purification, the methyl mercaptan, ethyl mercaptan, carbonyl sulfide, and carbon disulfide concentrations were 1.3; 1.4; 2.1; and 3.3 mg/cu m. The gases from the thermal cracking of an oil tar fraction after concentration at -80 C and desorption at 40 C contained 4.4% of hydrogen sulfide, 0.00047% of methyl mercaptan, 0.00083% of ethyl mercaptan, 0.00083% of carbon disulfide, and 0.00268% of carbonyl sulfide by volume. No high-boiling compounds of the thiophene and disulfide types were found in the propane-propylene fraction-derived gases.

32053 **APTIC NO. 54525**

Voelz, F. L., S. I. Weinberg, and B. G. Gower

AUTOMOTIVE EXHAUST EMISSION LEVELS BY GEOGRAPHIC AREA AND VEHICLE MAKE A NATIONWIDE SURVEY. *J. Air Pollution Control Assoc., 22(12):935-942, Dec. 1972. 3 refs.*

A nationwide survey of automotive exhaust emission levels was conducted by geographic area (California, Pennsylvania, Chicago, and Texas) and vehicle make. The model year (and the associated accumulated mileage), the presence of control devices, and the state of maintenance were the primary factors involved in the gross exhaust emissions from the vehicle population. Idle carbon monoxide distribution curves showed large variations in the 50% population levels for specific make vehicles in each geographical area. Withe the exception of the 1970 make E vehicle, the curves showed that at any percent vehicle population, the 1970 and 1968-1969 vehicles outside of California have lower idle CO emissions than those in California. The percent vehicle population for the 1970 models with idle CO greater than 3.0% depended on the make and test area and ranged from 24 to 57% compared to a national average of 38%. For idle hydrocarbons greater than 330 ppm, the percent vehicle population varied from 12 to 35% compared to a national average of 23%. Similar variations with geographical areas were found for the other year groups. Vehicle population (by make)% idle CO distribution curves for the 1970 models in the combined areas of Chicago, Pittsburgh, and Philadelphia showed a wide variation in emission distributions by make. Idle CO emissions ranged from 0.9 to 3.2% at the 50% population (by make) level, while the percent of vehicles which emit 1.0% or less idle CO ranged from 52-18% depending on the make. (Author summary modified)

32054 **APTIC NO. 55106**

Wisely, F. E., G. W. Sutterfield, and D. L. Klumb

USE OF REFUSE OF FUEL IN AN EXISTING UTILITY BOILER. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 97-101. (June 4-7.)*

The City of St. Lousi, Missouri and the Union Electric Co. are collaborating in a full scale test tor the feasibility of burning prepared refuse as supplementary fuel in an existing pulverized coal-fired boiler. Raw municipal refuse is milled to small particles, magnetic metals removed, and the remainder fired pneumatically to a 125 mw boiler unit. The refuse comprises quantities on the order of 10% of the heat requirement of the boiler. No modifications have been made to either the electrostatic precipitators or the bottom ash handling system, though some increased loading is expected upon the precipitators. Ash fusion temperatures of refuse are in the same range as those of Illinois bituminous coal. The possibility of a slight increase in corrosion potential has been indicated, though the removal of magnetic materials, together with the zinc, lead, and tin which often will be bonded to them, is expected to have a possible beneficial effect. (Author abstract modified)

1971

32055 **APTIC NO. 54695**

New Jersey Dept. of Transportation

FINAL ENVIRONMENTAL IMPACT STATEMENT. ADMINISTRATIVE ACTION FOR INTERSTATE ROUTE 280-STICKEL BRIDGE TO ROUTE I-95, TOWN OF HARRISON AND TOWN OF KEARNY, HUDSON COUNTY, NEW JERSEY. *34p., Dec. 6, 1971.*

NTIS: PB 207112-F

This projected highway will have an insignificant impact upon the ecological systems in the designated area. There will be the normal adverse impacts any high-speed freeway has on neighboring inhabitants. These impacts, such as noise, will be reduced through special highway construction and design practices. Beneficial impacts on the community due to the highway include improved traffic flow on the local streets and reduced air and noise pollution in Harrison. It will provide improved access to Harrison and Kearny, forming a vital link in the Interstate Highway System. (Author summary modified)

32056 **APTIC NO. 54720**

Pennsylvania State Dept. of Transportation

FINAL ENVIRONMENTAL STATEMENT. ADMINISTRATIVE ACTION FOR L. R. 1035 SPUR-F SECTION C10, BERKS COUNTY. *63p., Nov. 23, 1971.*

NTIS: PB 199239-F

Construction of a limited access four-lane divided highway in the vicinity of Reading, Berks County, Pa., was discussed in relation to its impact on the environment. The spur route will provide a connection between the Reading Outer Loop, L. R. 1035, and an inner loop, composed of the Warren Street Bypass, L. R. 06150 and the West Shore Drive, L. R. 793. This improvement will have a significant positive environmental effect on economic activity, public safety, and the conduct and financing of government. It will have a slight adverse effect on the environment involving ambient noise level, behavior patterns of the species, breeding, nesting and feeding grounds, air pollution, and the disruption of school bus routes. There are no significant adverse effects due to the proposed project. (Author summary modified)

32057 **APTIC NO. 54741**

General Services Administration, Washington, D. C.

A REPORT ON THE GENERAL SERVICES ADMINISTRATION S DUAL-FUEL VEHICLE EXPERIMENT: POLLUTION REDUCTION WITH COST SAVINGS. *Washington, D. C., U. S. Government Printing Office, 27p., 1971 (?). 5 refs.*

GPO

The Federal Government s first fleet of 12 natural gas-fueled vehicles has been operating at the Veterans Hospital, Sawtelle, in West Los Angeles since October 1969. As compared with gasoline-fueled vehicles of the same type and age, the natural gas test vehicles emit 82% less hydrocarbon pollution, 87% less carbon monoxide, and 53% less oxides of nitrogen; lead emissions are completely eliminated with the test vehicles. The test vehicles meet all new vehicle standards up to 1975, meet or exceed 1975 new car standards for hydrocarbons and carbon monoxide, and show promise of meeting the 1975 standards for nitrogen oxides. At the test vehicle fleet mileage average of 11,565 miles per vehicle per year, a cost savings of $101.50 per vehicle year is projected. A greater savings could be predicted if Los Angeles commercial gas rates are used and California tax levels are paid (11 cents/gal on gasoline and 3 cents/cu ft on natural gas). A more conservative estimate is obtained if the capital cost of the Sawtelle pumping station is charged at 10 years depreciation and full utilization, although a saving is still projected for 5000 miles or more per vehicle year. The test fleet has compiled an excellent safety record, and detailed improvements continue to be made to the end that natural gas-fueled vehicles are expected to be less than those operating on regular gasoline. (Author summary modified)

32058 **APTIC NO. 54746**

Montana State Dept. of Highways

FINAL ENVIRONMENTAL STATEMENT FOR PROJECT F 268(7), RYEGATE-EAST. *64p., Dec. 22, 1971.*

NTIS: PB 200373-F

The environmental impacts of a 12.2-mile roadway which will connect a point on U. S. Highway No. 12, just east of Ryegate, Montana, with a point approximately 4 mi west of Lavinia are discussed. This project will provide a 34-foot wide roadway with two 12-foot traffic lanes for the faster and more efficient transportation of the farmer and rancher bringing his products to market. The existing character of the area should not be significantly altered, and no families will be displaced due to this project. The effects on the environment during construction, such as changes in traffic flow and property access, plus increased noise and air pollution after completion of the project should be minimal. There should be no appreciable effect on water pollution or wildlife. The acquisition of right-of-way for this project should not affect the local tax base. (Author summary modified)

32059 **APTIC NO. 54831**

Florida Dept. of Transportation

FINAL ENVIRONMENTAL STATEMENT. ADMINISTRATIVE ACTION FOR STATE JOB NO. 26050-1506, FEDERAL JOB NO. F-008-1(9), STATE ROAD 24, ALACHUA COUNTY, FLORIDA. UPGRADING OF S. R. 24 FROM SPERRY PLANT TO WALDO. *Dept. of Transportation, Federal Highway Administration, 37p., Nov. 12, 1971.*

NTIS: PB 202171F

The final environmental statement is presented for a project consisting of upgrading State Road 24 in Alachua County, Florida from an existing two-lane rural roadway to a four-lane, divided rural roadway. No permanent effects on air pollution levels are anticipated as a result of the subject construction, and temporary effects during construction would be limited to dust being picked up and carried by winds. The air pollution effects of such wind erosion can be minimized by having the contractor water disturbed areas, spread calcium chloride, or provide other approved dust control measures. Automobile exhaust fumes would increase as the traffic increases; but with newly enacted regulations on automobile emission controls, these levels should be reduced in the future rather than increased.

32060 **APTIC NO. 54832**

New York State Dept. of Transportation

FINAL ENVIRONMENTAL STATEMENT. ADMINISTRATIVE ACTION FOR A PORTION OF HAUPPAUGE-PORT JEFFERSON, STATE HIGHWAY 9376, NEW YORK STATE ROUTE 347, BROWNS ROAD TO ROUTE 25A, AND FOR A PORTION OF SMITHTOWN BRANCH-CORAM, STATE HIGHWAY 8268, NEW YORK STATE ROUTE 25, SUNNY ROAD TO HAWKINS ROAD, TOWNS OF SMITHTOWN AND BROOKHAVEN SUFFOLK COUNTY. *Dept. of Transportation, Federal Highway Administration, 33p., Nov. 15, 1971.*

NTIS: PB 200530F

The final environmental statement is presented for a project which provides for the improvement and reconstruction of a portion of Route 347 as a controlled access type facility from Browns Road to Route 25A and for a portion of Route 25 as a divided highway from Sunny Road to Hawkins Road; the project which includes 8 mi of Route 347 and 2 mi of Route 25 is located in the towns of Smithtown and Brookhaven in Suffolk County, New York. An increase in air pollution to some properties adjacent the highway location is an unavoidable adverse environmental effect, although the overall effect for the surrounding area would be a reduction in pollution due to less traffic and congestion on the adjoining highway system and the improved operating conditions on the proposed highways. Every effort will be made to minimize the adverse effects through modern design techniques such as landscaping and depression of the highways where feasible.

32061 **APTIC NO. 54834**

Oregon State Highway Div.

FINAL ENVIRONMENTAL IMPACT STATEMENT. ADMINISTRATIVE ACTION FOR WELLS CREEK-JACK CREEK PASSING BAYS, UMPQUA HIGHWAY, DOUGLAS COUNTY. *Dept. of Transportation, Federal Highway Administration, 23p., Nov. 23, 1971.*

NTIS: PB 201377F

The final environmental impact statement is presented for construction of 11 passing bays within a 26 mile section of Umpqua Highway (Ore. 38) between Wells Creek and Jack Creek in Douglas County, Oregon. Production of harmful emissions causing air pollution by motor vehicles is judged to be lessened due to the higher and more constant speed, although there may be more vehicles using the road, thus cancelling the effect. The Environmental Protection Agency recommends that all road fills near or adjacent streams should be rip-rapped to prevent erosion and that perforated pipes should be driven back into any potential slide areas uncovered to reduce slide action.

32062 **APTIC NO. 55085**

New York State Dept. of Transportation, Watertown, N. Y.

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR GOUVERNEUR-DEKALB SH 5283, RICHVILLE-DEKALB JUNCTION SH 8476, ST. LAWRENCE COUNTY. PIN 7043.01. *Dept. of Transportation, Federal Highway, 32p., Dec. 13, 1971.*

NTIS: PB 199862 F

An environmental impact statement is presented for a New York State Department of Transportation proposal to reconstruct a portion of U. S. Route 11 in the town of DeKalb, St. Lawrence County. The proposed improvement begins 0.1 mi northeast of the Gouverneur-DeKalb Town Line and extends northeasterly, passing through the village of Richville and ending about 0.25 mi southwest of the Penn Central railroad tracks, for a total distance of 6.7 mi. Three alternate solutions are under study within the Village of Richville: one east of the existing alignment (Segment 1); the existing alignment (Segment 2); and one west of the existing alignment (Segment 3). Segment 1 will provide a route around the developed portion of the village, thus improving noise and air pollution levels in the village s immediate vicinity. Segment 2 would be generally the same as the existing route through the village, and noise and air pollution levels would be maintained at their present readings with only normal increases. Segment 3 would provide advantages similar to Segment 1, the exception being four property relocations. Segment 2 will require a loss of shade trees and some of the frontal ROW, thus reducing aesthetics and parking in front of business properties. Segments 1 and 3 will require some channel work and may affect village business by diverting thru traffic.

32063 **APTIC NO. 55113**

National Industrial Pollution Control Council, Washington, D. C.

THE ELECTRIC POWER INDUSTRY: SUB-COUNCIL REPORT. *20p., Oct. 1971.*

GPO

A general overview is presented of the electric utility industry, the environmental side effects of its operations, and certain programs underway to reduce those effects. The electric utility industry in the United States is made up of 3480 separate systems owned by the Federal government, cooperatives, investors and municipal governments. The generation of electric power is predicted to increase substantially in coming decades, with fossil fuel generating systems being expected to remain the principle sources of electric power through 1990. Nuclear fueled systems are expected to assume a far greater portion of the generating load by that time. In planning new electric power facilities, considerable attention is given to land use and esthetic considerations, as well as to air and water quality and radiation protection. The electric utility industry emits about 45% of the oxides of sulfur, 25% of the oxides of nitrogen, and 25% of the particulate matter emitted in the U. S. To reduce sulfur oxide emissions, natural gas and low sulfur fuels are burned whenever possible; research is in progress to find effective means for removing sulfur oxides from flue gases. While there is no large-scale method for removing NOx once it has been formed, alterations in the combustion process in power plant boilers can achieve substantial reductions in NOx formation. Cyclone filters, fabric filters, electrostatic precipitators, and gas scrubbers can effectively remove most particulates from flue gases. Thermal discharges and cooling water systems for power plant condensers are discussed, particularly in relation to environmental considerations and research programs. The amount of radiation released by nuclear power plants is insignificant, and plants are equipped with highly reliable protection systems to take care of abnormal circumstances. Further system improvements are expected to come from a number of industry-supported research and development projects.

32064 **APTIC NO. 55154**

Billard, F., G. J. Madelaine, A. Chapuis, J. Fontan, and A. Lopez

STUDY OF ATMOSPHERIC POLLUTION IN URANIUM MINES. *(Contribution a l etude de la pollution de l atmosphere des mines d uranium). Text in French. Radioprotection, 6(1):45-61, 1971. 36 refs.*

Radon daughter activity is present in the atmosphere of uranium mines in a neutral or ionized form in sa spectrum of dimensions between 0.0001 and several micron which consitute a major part of ambient radioactive pollution. Distribution of radioactivity and concentration and granulometry of particles encountered in French uranium mines were determined. Particle concentration was determined by means of a condensation nuclei counter. The mean particle concentration under normal working conditions was of the order of 50,000 particles/cu cm, particle size was of the order of 6 times 10 to the -7th cm. The concentration is somewhat lower than that of the urban atmosphere, particle size is about three times smaller than that of urban particulates. It would seem from the mobility spectrum of charged particles that 60% RaA, B, and C is fixed on particles with a diameter smaller than 0.1 micron and that less than 1% is fixed on free ions, uncombined atoms, or unattached radon daughters. The problem of fixation of radioactivity on different particles present in uranium mines is far from resolved. It is certain however that diesel smoke and oil mist in the atmosphere reduce considerably the percentage of radioactivity fixed on uncombined particles.

32065 **APTIC NO. 54724**

Sadiq, Shehzad

DEVELOPMENT AND APPLICATION OF A NUMERICAL TECHNO-ECONOMIC ENERGY FORECASTING MODEL. *Oklahoma State Univ., Dept. of Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., May 1971, 177p. 134 refs.*

The development of a numerical techno-economic model for forecasting the U. S. total energy requirements for 1980, 1990, 2000, and 2025 is described. The methodology is based on an engineering (system) analysis of historical time-series data for six techno-economic aggregate parameters which are gross national product, population, labor force employed, level and spread of technology, price of energy, and total energy requirements. Thy model affords generality in its application to either a developed country, a smaller region, or a developing country. The proposed forecasting model is tested using appropriate data for the period 1915-1970. Using the prediction equation to simulate the model, the total U. S. energy requirements are forecast to be 91.1, 122.8, 169.2, and 300.3 quadrillion BTU for the years 1980, 1910, 2000, and 2025 respectively. The average values for the published forecasts for the years 1980, 2000, and 2025 are 84.2, 143.5, and 252.2 quadrillion BTU respectively. The U. S. per capita energy consumption is forecast to be 379.6, 427.9, 508.9, and 711.5 million BTU for the years 1980, 1910, 2000, 2025 respectively. The Energy-GNP coefficients will continue to decline gradually during 1970-2025. (Author conclusions modified)

32066 **APTIC NO. 54722**

Ulmer, G., J. Hocheim, V. Kuhn, and G. Lepretre

STUDY OF EMISSIONS OF POLLUTANTS BY INDIVIDUAL HEATING APPLIANCES. *(Etude des emissions de polluants par les appareils de chauffage individuel). Text in French. Centre Technique des Industries de La Fonderie, Paris (France), Contract 69-01-759, 97p., April 1971. 6 refs.*

Test-bench studies were conducted on the emission of pollutants in the effluents of different types of individual heating appliances (power lower than 50 th/h), operating with solid fuels and domestic fuel oil. A determination was made of the emission of particles of soot and dust by the smoke-test and the dust index, as well as the emission of sulfur and nitrogen oxides. The emission of particles is very low with domestic fuel oil and rarely exceeds 0.1 g/kg, provided the aeration of the atomizing burner and the draught of the vaporizing burners are properly adjusted. It is also very low on the average, in spite of a temporary peak, with solid fuels containing only a few materials distillable without combustion (dry coals and smokeless egg coal). The emission of sulfur oxides depends essentially on the sulfur content of the fuels; it is lowest in domestic fuel oil. The emission of nitrogen oxides is very limited (1.5-60 ppm) owing to the relatively low combustion temperatures.

32067 **APTIC NO. 54674**

Vandeloise, R.

METHODS FOR THE PREVISION OF SPECIFIC FIREDAMP EMISSIONS FROM LEVEL FACES IN BELGIAN COAL BASINS. *(Les methodes de prevision des degagements grisouteux specifiques appliquees aux tailles en platcures des bassins belges). Text in French. Ann. Mines Belg., no. 9:867-898, Sept. 1971. 5 refs.*

Factors influencing the specific firedamp emissions from level faces were studied, and the validity of the Schulz-Winter, Stuffken, Gunther and Lidin models of degasification zones verified for a series of Belgian workings with known specific methane emissions in view to impriving the prevision of specific emissions from level faces. Increased rate of extraction resulted in increased amount of total emission in absolute value, and in apparent reduction in the specific emission. Within a face length range of 150 to 300 m, the face length seems to have little if any effect on the specific emission. Reduction of the specific firedamp emission at rates of extraction exceeding 3 m/day was observed. Increase in the specific emission during the life of the workings was noted. The prediction of specific firedamp emissions requires the knowledge of the firedamp concentration of the seams and of their surrounding rock, and possibly also of the degree of degasification caused by earlier working of neighboring seams, as well as data regarding the degasification zones which surround the working and regarding the degree of gasification of the seams affected by and included in these zones. Being in a position to define more clearly the zones of degasification which surround the workings, and to establish the coefficients of degasification of the affected seams, particularly through measurements of the firedamp concentrations in the seams, it is possible to predict the specific firedamp emission and, consequently, to predict the ventilation and drainage requirements in the workings.

1970

32068 **APTIC NO. 54845**

Burt, W. T., III and Bruce J. Gueho

AIR POLLUTION FROM HOT MIX PLANTS. *Louisiana Department of Highways, Research and Development Section, Proj. 68-1Ch(B), Louisiana HPR 1 (8), Dept. of Transportation, Federal Highway Administration. Research Rept. 50, 53p., Oct. 1970.*

NTIS: PB 199355

A study undertaken to determine the suspended particulate and dust pollution caused by hot mix plants in the state of Louisiana has found that no plant operating in the state consistently operates within the regulations established by the Louisiana Air Control Commission while maintaining reasonable production. The conditions of pollutant emission appear to vary from 1000 micrograms/cu m/day to 175 micrograms/cu m/day. Almost half of the pollution caused by most plants originated from sources other than the stack, and all plants could improve their particulate emissions through more care and concern for their present equipment and procedures. Stack emissions should be reduced by the use of water scrubbers or bag collectors. Present hot mix equipment was highly efficient for producing hot mix but not necessarily efficient for the reduction of dust. Additional covers and improved, better fitting covers need to be designed, and frequently removed plates should be more sturdily built or have an additional, flexible cover to prevent leakages due to dents and warpage by temperature. Stack height is insufficient. The present Louisiana regulations should be slightly altered for a period of 3 years to allow for purchase of better equipment, for proper repair and cleanup procedures, and for production personnel to acclimate themselves to the necessary techniques.

1969

32069 **APTIC NO. 54262**

Skorupski, W.

DUST CONTENT IN THE AIR DURING THE PROCESS OF SEED CLEANING. *(Zapylenie powietrza w procesie czyszczenia nasion). Air Conserv. (English translation from Polish of: Ochrona Powietrza). 3(4(12)):37-46, 1969.*

NTIS: TT 7055123/4

In order to obtain data for the designing of dust collection installations in seed cleaning plants, the quantity of dust and the degree of pollution emitted to the atmosphere were measured. The physical properties and chemical compositions of these dusts were also studied. The average consumption of air did not exceed 2800 cu m/hr and the concentration of dust in the exhaust air is about 0.69 cu/m. The material carried off with the air consists of mineral dusty impurities and organic wastes. Results of dust analyses, chemical analyses, and organic compound densities for various seeds are given. A two-stage dust separation from the air precedure is recommended consisting of a settling chamber or cyclone and a cloth filter.

1968

32070 **APTIC NO. 54783**

National Assoc. of Secondary Material Industries, Inc., New York

STUDIES OF DISLOCATION FACTORS: NO. II. THE SECONDARY MATERIAL INDUSTRIES AND ENVIRONMENTAL PROBLEMS. *22p., 1968. 34 refs.*

A study of the secondary material industries and environmental problems such as solid waste disposal, urban renewal, licensing and zoning regulations, industrial beautification, and air pollution control is presented. Air pollution looms as the major problem, particularly for some of the smaller and medium sized firms in the industry. Two of the major problems facing the metals industry in this area revolve around zinc chloride emissions and the incineration of insulated copper wire scrap Sizeable sums have been committed in an attempt to control emission of zinc chlorides in secondary zinc operations but with little visible success thus far. Experimentation in the recovery of insulated copper wire scrap is also being conducted, and a number of firms have installed specially constructed incineration equipment to burn insulated wire and have succeeded in securing approval from local air pollution officials. The National Association of Secondary Material Industries through its Air Pollution Committee has been engaged in conferences and workshops and has developed a bibliography of air pollution material available at the NASMI office in New York.

32071 **APTIC NO. 54672**

McLean, N.

GAS CLEANING PLANT AND ITS APPLICATION TO REFUSE DISPOSAL. *Public Cleansing (London) 58(3):106-113, March 1968. 5 refs.*

Under Britain s Clean Air Act, it is an offense to emit smoke as dark or darker than Shade No. 2 of the Ringelmann Chart. While there is no general limit for the emission of dust and grit, general standards built up in conjunction with local authorities and Alkali Inspectorate specify 0.2 grains/cu ft N.T.P. as the maximum. In other specialized processes, such as basic oxygen steelmaking plants, the limit is set at 0.05 grains/cu ft N.T.P. In 1964, the Ministry of Housing and Local Government appointed a Grit and Dust Working Party to consider means of measuring dust and grit and advise on levels of emissions admissable. The Working Party was unable to make definite recommendations, but stated that emissions may have to be based on some percentage of material burned or on grains/cu ft at a standard carbon dioxide figure. Dark smoke usually results from the emission of fine particles of unburned carbon due to the incomplete combustion or irregular firing of solid fuels. The emission of dust and grit depends on furnace design, fire-bed draught, fuel, ash extraction from the furnace, on load cleaning gear, and furnace load. Chimney emissions do not bear any direct relationship to the concentration or total quantity of fly ash leaving the chimney. The most economical solution to a dust and grit emission problem is to approach a reputable manufacturer of gas cleaning equipment who can supply both equipment and experience.

1967

32072 **APTIC NO. 54736**

Barton, A. E. and E. J. Ostle

TESTS ON EMISSION FROM REFUSE INCINERATION CHIMNEY STACKS. *Public Cleansing (London), 57(1):29-56, Jan. 1967.*

The amount and quality of the grit, dust, and noxious gases emitted from Birmingham s refuse disposal incinerators were investigated. The apparatus used for sampling the grit and dust emissions is mentioned. Grit and dust were collected in a cyclone hopper, with particles of 2 micron or less collected in a backing glass wool filter. Brimingham s Lifford incinerator was of a relatively new batch type with a water trough grit arrester. The emissions of both dust and grit from this incinerator were excessive, with about 28% of the particles emissioned being sufficiently small to require the use of an electrostatic precipitator, bag filter, or high-efficiency washing system for efficient cleaning. In terms of emission control, the Lifford unit was relatively more efficient than an older, batch-type unit at Tyseley; the emissions from the latter were greater in terms of both weight and concentration. For purposes of comparison, the emissions from refuse incinerators in Sutton Coldfield and Derby were measured, along with those from a tea manufacturing company s incineration unit. The specific emission from municipal incinerators will not normally exceed those of industrial units. The emission of noxious gases by municipal incinerators was measured using a standard Orsat apparatus; all phases of incineration were checked during all four seasons. The gases from the municipal units were relatively free from many of the noxious gases looked for and, in general, the municipal units compared favorably with industrial units with respect to sulfur, chlorine, and nitrous gas emissions. The following should be considered in working toward the improvement of municipal incineration: the effects on incinerator design and emissions of changing refuse compositions; and the development and utilization of more efficient gas cleaning equipment.

32073 **APTIC NO. 54827**

Lahmann, E. and H. Gummlich

TRAFFIC-GENERATED AIR POLLUTION AND NOISE. *(Luftverunreinigungen und Geraeuschentwicklung durch den Kraftverkehr). Text in German. Bundesgesundheitsamtes, Inst. fuer Wasser-, Boden- und Lufthygiene, WaBoLu-Bericht, Rept. 6, 14p., May 1971. 46 refs.*

General problems of and factors influencing the traffic-generated air pollution and noise are discussed on the basis of actual traffic-generated air pollution and noise studies in various cities in Germany. As an average, gasoline engine exhaust gases contain 1-7% of carbon monoxide, 0.01-0.2% of hydrocarbons, 0.01-0.1% of oxidized hydrocarbons, 200 micrograms of polycyclic aromatic condensates per g, traces of soot, 0.01-0.3% of nitrogen oxides, and 5-30 mg of lead compounds per cu m. Diesel engine exhausts contain 0.01-0.1% of CO, 0.01-0.04% of oxidized HC, 1 microgram of polycyclic aromatic condensates per g, 0.001-0.1% of NOx, soot, and traces of sulfur dioxide. Lead and CO concentrations of 0.13-13.4 micrograms/cu m and 4-100 ppm were measured in cities in Germany. The maximum allowable exhaust CO emission at idle has been set at 4.5% in Germany, and the crankcase hydrocarbon emission is required not to exceed 0.15% of the total fuel consumption. Rapid decrease in the CO concentrations in the air with the distance of the roadway in both horizontal and vertical directions was observed. Linear relationships between traffic density and the CO concentrations in the air, as well as between the respective CO, hydrocarbon, and lead concentrations were established. Smooth traffic, loose building-up in busy streets, and the coincidence of the direction of the streets with the prevailing wind direction were determined to be favorable for a rapid dispersion of the automotive exhaust gases, and thus for the maintenance of low exhaust pollutant concentrations.

1962

32074 **APTIC NO. 54295**

Tsvetkov, Tsvetan Ev.

METALLURGY OF HEAVY NONFERROUS METALS. PART 1 - COPPER. *(Metalurgiya na tezhkite tsvetni metali). Tekhnika State Publishing House, 2nd ed., Sophia, 1962. 51 refs. Translated from Bulgarian. Leo Kanner Assoc., Redwood City, Calif., 395p.*

Contemporary methods for the processing of copper concentrates and ores are discussed. The theoretical foundations and technology of the more important copper extraction operations are described: production of copper matte in flame, electric and shaft furnaces; processing of the matte in a converter and extraction of black copper; and flame and electrolytic copper refining. A brief description is given of the hydrometallurgical methods used for the extraction of the copper from copper ores. A description is also given of furnaces and other operators utilized in copper extraction, with a schematic presentation of the methods for determining the dimensions of the most important among them. Pollutant emissions are mentioned. (Author abstract modified)

CONTROL METHODS

1973

32075 **APTIC NO. 54180**

Kansai Branch of the Fuel Society of Japan

A RECORD ON A MEETING FOR NON-POLLUTION FUEL AND NON-POLLUTION COMBUSTION. *(Mukogai nenryo to mukogai nensho ni kansuru zadankai kiroku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(10):993-1018, Oct. 1973.*

A meeting after a lecture on non-polluting fuel and combustion discussed fuel standards, effect of fuel on pollution, desulfurization of petroleum, the future industrialization of city gas, and how to prevent pollution due to boiler combustion. The blend of fuel oils and the total energy system, absorption equipment for nitrogen oxide removal, and different regulations for each district were also discussed. Petroleum is expected to rise in price in the near future. Small boilers are nuisances from the standpoint of controlling pollution. Methods of measuring NOx and noise were also mentioned.

32076 **APTIC NO. 54606**

Environmental Protection Agency, Washington, D. C., Working Group 2

SHORT-TERM CONTROL STRATEGIES. *In: Highways and Air Quality Special Report 141. p. 46-61, 1973.*

Short-term control strategies for motor vehicle pollution abatement are presented with the major objectives being to reduce the amount of vehicle-miles traveled (VMT) and to improve vehicle performance; strategies that reduce VMT are considered to be the most effective potentially. The strategies considered were: improvement of traffic flow by alleviating delays and increasing average vehicle speeds, the staggering of work hours, the improvement of public transit, the staggering of commercial deliveries, maintenance of clear travel ways, provision of public information and education, institution of parking controls, vehicle and fuel rationing, economic or physical traffic restraints, emission inspection requirements, use of cleaner fuel in fleets, the control of idling engines by requiring that engines stop during traffic delays, improvement in enforcement, adoption of a four-day work week, increasing automobile occupancy, and the establishment of traffic bypasses including the use of circumferential routes, inner-city barriers, and directive signs or signals. A summary list is provided which rates each proposed strategy by impact, feasiblity, time required, and funding required.

32077 **APTIC NO. 54640**

THE EXPANSION OF THE REFINERY HEIDE. *(Die Erweiterung der Raffinerie Heide). Text in German. Erdoel Kohle (Hamburg), 26(9):500-502, Sept. 1973. 6 refs.*

The expanded Texaco refinery at Heide is described. Shipping of mineral oil supplies, sources of energy and water, and environmental protection are discussed. In an incinerator, solid waste products (oil-polluted soil, paper, and packing material) and liquid waste products (such as old oil and sludge) are burned at temperatures above 800 C. The remaining residues are sterile and free of oil. The flue gases are cleaned in an electrostatic precipitator to limit values demanded by the VDI guideline 2301. All safety valves of process facilities which release gases and vapors are connected to a flare system. Separate flare systems are available for the refinery facilities and the chemical facilities. Both systems are connected with a compressor which draws off the gases, compresses them, and feeds them into the heating gas mains. Annoyance through soot formation is avoided. The stack heights have been dimensioned according to regulations.

32078 **APTIC NO. 54756**

Stuurgroep en de Werkgroepen voor Milieuzorg van het KIVI

MAN AND ENVIRONMENT, PART 2: CLEAN AIR MAINTENANCE, ITS TECHNICAL AND ADMINISTRATIVE POSSIBILITIES. *(Mens en Milieu, deel 2: Zorg voor zuivere lucht, technische en bestuurlijke mogelijkheden). Text in Dutch. Ingenieur, 85(32-33):645-649, Aug. 1973.*

General administrative and technical measures for air pollution abatement are surveyed. Considerable abatement of air pollution by a highly moderate amount of technical measures and at relatively low cost was possible, and pollution control at the source of emission was much more efficient than the abatement of ground level concentrations. Minimization of material losses, especially such as of granulated materials and hydrocarbons, and provisions for minimum leakage in material handling and technological processes were essential for an efficient dust and hydrocarbon emission control in the industry. Nitrogen oxide emissions should be controlled at their chief sources; industrial combustion processes and power generation. Exhaust carbon monoxide emissions can be reduced by improvements of four-stroke engines, while hydrocarbon emission control measures should apply to four-stroke and two-stroke engines alike. Nitrogen oxide emission control is essential for both four-stroke and diesel engines. The use of lead-free gasoline would entail an increase by about 20% in the gasoline consumption, which would lead to even more exhaust emission. Emission surveys, pollutant dispersion studies in urban and industrial areas, and systematic pollutant concentration measurements, e.g., by means of national monitoring networks, are necessary for an efficient approach to the pollution control problem.

32079 **APTIC NO. 55263**

EUCEPA CONFERENCE ON ENVIRONMENTAL PROTECTION IN THE PULP AND PAPER INDUSTRY HELD IN ROME MAY 7 TO 12, 1973. *(Eucepa-Tagung ueber Umweltschutz in der Zellstoff- und Papierindustrie vom 7. bis 12. Mai 1973 in Rom). Text in German. Wochenbl. Papierfabr., 10(17): 669-675, 1973.*

Reports on the effects of waste products from the pulp and paper industries on the environment read at the Conference included paper read on consequence of water and air pollution, problem of decortication, problem of waste water and sludge in the planning of a paper mill, paper mills without pollution, and reality and future outlook. Relevant to in-plant measures for the prevention of water pollution by pulp mills were papers on the treatment of condensates, pollution reduction in the paper industry with focus on oxygen bleaching, waste water free sulfate pulp mill, a closed cycle pulp mill, and evaluation of measures designed to control water and air pollution. Relevant to in-plant measures for the prevention of water pollution in paper mills were reports on the closed water-cycle in the paper mill, characteristics of a water re-use system with regard to waste water control, waste water purification by vacuum filtration, the effect of raw materials and of chemicals on losses in waste water, the use of sizing machines as a contribution to pollution control, and treatment and disposal of residual waste water sludge in the paper industry. Relevant to external waste water treatment were reports on Mechanical waste water treatment. Biological degradation and detoxification of additives and of biocides in waste water, the use of silicates and of polyelectrolytes for flocculation, the biological purification of waste water in the paper industry, tertiary and supplemental treatment methods of tail waters, activated carbon and other methods for sulfate paper mill waste water discoloration, new fine particle technologies for the solution of environmental problems in the paper industry, and a study on waste water treatment in an Italian paper mill were discussed.

32080 **APTIC NO. 55181**

Ando, Jumpei and Heiichiro Tohata

NITROGEN OXIDE ABATEMENT TECHNOLOGY IN JAPAN-x1973. (FINAL REPORT). *Process Research Inc., Cincinnati, Ohio and Chuo Univ., Kasuga, Tokyo (Japan), Faculty of Science and Engineering, Environmental Protection Agency Contract 68-02-0242, Task II, Program Element 1A2013, EPA-R2-73-284, 41p., June 1973. 5 refs.*

NTIS: PB 222335

The technology available in 1973 for the abatement of oxides of nitrogen in Japan is reviewed. A general survey section provides information on environmental NOx concentrations and quality standards, the necessity for emission control, and the development of control methods and measurement methods. A section on NOx abatement via combustion control covers pilot plant tests on NOx abatement, large-scale tests, and the development of a low-NOx burner. Reduction processes for NOx abatement include the Hitachi Shipbuilding process, reduction by sodium sulfite, and other catalytic reduction processes. The following absorption processes are also discussed: sodium scrubbing, the alkali permanganate process, the sodium-potassium permanganate process, alkali scrubbing, sodium scrubbing, and other alkali scrubbing processes.

32081 **APTIC NO. 54855**

Ando, Zyunpei

RECENT MOVEMENT OF DESULFURIZATION IN U.S.A. *(Beikoku ni okeru datsuryu no saikin no doko). Text in Japanese. Kagaku Kogyo (Tokyo), 24(10):1337-1341, Oct. 1973. 11 refs.*

Japanese and American desulfurization technology is compared. Coal desulfurization by means of solvent extraction, liquefication, gasification, and desulfurization by coal gas combustion is discussed. Heavy oil desulfurization is also considered in spite of the high cost involved. American wet lime processing of waste gas desulfurization is less economical than the Japanese methods. Cost differences depend mainly on the abolition or recovery of sludge, because sludge treatment increases cost in America, whereas in Japan it becomes a profit factor through by-product recovery. The Monsanto, Chemico, Wellman-Lord, and Double Alkali processes in America are discussed and seem to need improvement. Future uses for sulfur include sulfur asphalt, sulfur foam, sulfur concrete, and sulfur-coated fertilizer. Sulfur dioxide waste gas pollution is eight times as high in Japan as in the U.S.A.

32082 **APTIC NO. 54894**

Aratoi, Sachio

CLEANING EQUIPMENT FOR SMOKE. *(Baien seijo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-13476. 2p., April 12, 1973. (Appl. March 13, 1969, 1 claim).*

A mouth cylinder with an inclined bottom wall midway along the side of the cylinder is fitted to the top part of the main smokestack in order to clean the discharge smoke. A smoke discharging cylinder is formed by the inclined bottom wall and the cylindrical wall connecting with it. A forced driving axis is provided at the center of the smoke discharging cylinder, and line elements radiating in all directions are provided in several layers on the upper part of the driving axis. Inclinded wings are provided in an inverse funnel state on the lower part of the driving axis so that they project outside of the upper part of the mouth cylinder. The upper end of the driving axis is fitted with the end of the heavy oil supply pipe and the lowest part of the inclined bottom wall is connected to the end of the discharging pipe. The heavy oil supply pipe is connected to a pump leading to a heavy oil tank, and the axis is driven by an interlocking motor. Therefore, the smoke-containing exhaust gas is removed by the heavy oil falling down in a fume state through the rotating line elements, and the heavy oil containing dissolved smoke falling down the inverse funnel device or the inner cylinder is recovered.

32083 **APTIC NO. 54315**

Armbrust, Robert A.

COKE OVEN POLLUTION AND ABATEMENT IN NEW YORK STATE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1973. 7 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-242.)*

Medical studies conducted in metropolitan Buffalo, New York have shown a definite relationship between air pollution associated with the by-product coke oven industry and the health of the general population. The pollution has also been associated with the degradation of materials such as steel, fabrics, silver, nylon hose, and rubber. Sampling from 1963 to 1970 indicated that New York s air pollution program was inadequate to meet national primary standards for suspended particulates, and the coke oven plants were the source of the excess pollutants. Further studies showed a disproportionately high incidence of lung cancer among topside coke oven workers. Thus the existing coke oven rule was rescinded and a new one adopted. The new regulations were based on the existence of newly developed coke oven control systems. The following systems exist for the control of the particulate and gaseous emissions generated during oven charging: the Coaltek pipeline charging system; a single collecting main closed port system; a double collecting main closed port system; and direct smoke collection. The voluminous black clouds produced during pushing operations can be controlled by: the Mitsubishi pushing system; and the pushing control systems of Great Lakes Steel, Ford Motor Company, and National Steel Co. The white vapor produced during quenching is controllable by the wet quench tower, the traveling rotary quencher, and dry quenching. The new coke oven rule (Title VI NYCRR Part 214) applies to the by-product coke oven battery and auxiliary gas collecting and heating systems; limitations are placed on smoke density and the emission of sulfur compounds. It is expected that a significant step toward achieving national primary standards will have been accomplished by mid-1977.

32084 **APTIC NO. 55965**

Azelborn, N. A., W. R. Wade, J. R. Secord, and A. F. McLean

LOW EMISSIONS COMBUSTION FOR THE REGENERATIVE GAS TURBINE: PART 2-- EXPERIMENTAL TECHNIQUES, RESULTS, AND ASSESSMENT. *Preprint, American Society of Mechanical Engineers, 7p., 1973. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Washington, D. C., April 8-12, 1973, Paper 73-GT-12.)*

A program to experimentally evaluate the Externally Vaporizing Combustor (EVC) and assess the concept of lean homogeneous combustion is described. Of importance was the test set-up and instrumentation and the technique used for projecting engine emissions from test rig data. Results from the testing dramatically indicated the difference in emissions between heterogeneous droplet combustion and lean homogeneous combustion. For the EVC, emissions indices of oxides of nitrogen, carbon monoxide, and hydrocarbons were evaluated for several engine operating conditions over the range of the Federal test driving cycle. A weighted average of these values, based on time spent at different operating conditions over the Federal driving cycle prescribed for vehicles equipped with gasoline powered internal combustion engines revealed projected emissions of NOx less than 1/2 of the 1976 Federal levels and CO and hydrocarbon emissions less than 1/10. Further work is needed to improve the system for practical application. (Author summary modified)

32085 **APTIC NO. 54524**

Barton, C. J., R. E. Moore, and S. R. Hanna

RADIATION DOSES FROM HYPOTHETICAL EXPOSURES TO RULISON GAS. *Nuclear Technol., 20(1):35-50, Oct. 1973. 31 refs.*

Production testing of the Rulison well, the second natural gas well developed by use of nuclear explosives, was completed in April 1971. The hypothetical radiation exposure situation examined was one which would have resulted if the gas originally present in the well has been withdrawn at a rate to give 1 million cu ft/day, after dehydration and carbon dioxide removal and the processed gas distributed by two gas companies to small communities in the area near the well. Tritium and 85Kr are the principal radionuclides present in the gas from the Rulison well. The average whole body dose from inhalation and skin absorption of tritium to members of the exposed public served by one of the gas transmission companies was estimated to be 0.6 mrem for the first year of gas use. The principal source of this hypothetical dose was exposure in the home to tritiated water vapor from cooking with unvented gas ranges. The use of unvented home heaters was not considered credible. Whole body doses from exposure to tritiated water vapor, dispersed in the atmosphere of the same communities, averaged 0.1 mrem for the first year. Continuous use of gas at the same rate would reduce the average dose to 0.02 mrem in the third year because contaminated gas in the chimney is diluted by the influx of uncontaminated gas from the surrounding formation. Whole body doses from 85Kr were estimated to be approximately 2% of the tritium whole body doses. (Author abstract)

32086 **APTIC NO. 54911**

Batel, Wilhelm

STATE AND TRENDS OF DEVELOPMENT OF FILTERING DUST COLLECTORS.

(Entwicklungsstand und-tendenzen beim Filtrationsentstauber). Text in German. Staub, Reinhaltung Luft, 33(9):359-367, Sept. 1973. 53 refs.

The dust separation processes in filters are reviewed and dust collection efficiency is discussed. The most influential parameter is the gas velocity. If particle separation by force of inertia is wanted, the flow velocity must be rather high. The particle separation through molecular diffusion diminishes the velocity. As filter media cloth, felts and paper are mostly used. A survey of the properties of textile fibers is given. The main criteria for the selection of a filter medium are lifetime, cost, and temperature resistance. The commonest type of filter is the bag filter, which is cleaned by rapping and by reverse air jet. The diameter of filter bags is usually 0.15 to 0.4 m, the length between 2 and 4.8 m. Illustrations of these filters; filters made of non-flexible filter material, which is important for the separation of fluids; and disposable filters with no automatic cleaning devices are given. Essential aspects governing the development of gas filters are increasing the collection efficiency, gas to filter surface ratios, propagation of ranges of application, and reducing costs and the maintenance effort. The essential element in aerosol filters is the filter medium. The textile or fabric materials have been greatly improved with respect to structure for the filtration process, ruggedness, and temperature stability. (Author summary modified)

32087 **APTIC NO. 54539**

Baum, Fritz

CHIMNEY SWEEPING AND THE PUBLIC TASK FOR PRESERVING CLEAN AIR.

(Schornsteinfegerhandwerk und oeffentliche Aufgabe zur Reinhaltung der Luft). Text in German. Gesundh.-Ingr., 94(9):262-268, 1973. 35 refs.

Domestic heaters for liquid and solid fuels contribute considerably to the total emission of pollutants of various kinds in the Federal Republic of Germany if they are not properly maintained and operated. The introduction of control measures became necessary. Laws are in existence presently in six states of the Federal Republic of Germany in North Rhine Westphalia, Bavaria, Hamburg, Lower Saxony, Rhineland Palatinate, and Hesse. Baden Wuerttemberg will soon follow with a similar law. For execution of the control measures simple measurement methods are available. As an executing body the organization of chimney sweeps has been appointed. In a number of states such measurements have already been carried out by chimney sweeps with great success. The results were analyzed by means of electronic data processing machines and were published at home and abroad. Further tasks in this direction will in future await the organization of chimney sweeps in the Federal Republic of Germany. Their cooperation in the erection and operation of large regional measurement grids will be sought.

32088 **APTIC NO. 54418**

Behie, S. W. and J. M. Beeckmans

ON THE EFFICIENCY OF A VENTURI SCRUBBER.

Can. J. Chem. Eng., 51(4):430-433, Aug. 1973. 15 refs.

The performance of a venturi scrubber with a 1 in. by 3 in. throat was determined using monodispersed uranine methylene blue aerosols in the size range of 0.8 to 3.0 micron at throat velocities ranging from 109.6 ft/sec to 245 ft/sec. Separate measurements, on the water separator showed that substantial aerosol removal took place in this unit, and the efficiency of the scrubber itself was calculated from these measurements plus overall efficiency measurements on the combustion scrubber and separator. These results were compared with values obtained from a theoretical model and agreement was generally satisfactory, although the theoretical efficiencies were lower than the experimental efficiencies at the highest air velocities, and vice versa. This may have been due to a number of factors which included reatomization of water in the diffuser and particle growth caused by excessive air humidity at the highest air velocity, and the inefficient water atomization and resulting poor throat coverage at the lower air velocities. (Author abstract modified)

32089 **APTIC NO. 54349**

Bellisio, Arthur A., Hippocrates G. Psyras, and Marvin M. Fein

PROCESS FOR USING N-ALKYL LACTAM FOR STRIPPING SULFUR DIOXIDE FROM GAS STREAMS AND RECOVERING LIQUID SULFUR DIOXIDE.

(GAF Corp., New York) U. S. Pat. 3,733,780. 17p., May 22, 1973. 4 refs. (Appl. April 17, 1972, 24 claims).

An improved process for treating a stack gas stream containing sulfur dioxide impurities has been developed which permits the stripping of SO2 down to 100 ppm or less, the recovery of SO2 as a liquid product, and the recycling of the liquid solvent for further use. The gas stream to be treated is passed through an absorption zone generally 5-85 ft in length and containing a lactam, preferably N-methyl pyrrolidone, at a gas mass flow velocity of 200-3000 lbs/hr/sq ft and a gas temperature of 35-65 C in order to reduce the SO2 content to less than 100 ppm and to remove at least 90% by volume of the SO2 content. The treated gas stream and the entrained or vaporized lactam are passed directly to a water scrubber zone in which at least 90% by weight of the lactam content is removed. A water stream having recovered the lactam and a lactam stream having SO2 dissolved therein are passed to a distillation zone in which SO2 and at least a portion of the water content are removed. A lactam-rich stream is recycled to the absorption zone where a lactam solution having about 25% by weight of water is maintained. The SO2 and water stream from the distillation zone is compressed and cooled to produce an aqueous solution of SO2. The aqueous solution is then heated in a second distillation zone to distill off the SO2 which is thereafter condensed and recovered as an essentially pure liquid containing at least 90-95% SO2 by volume. (Author abstract modified)

32090 **APTIC NO. 54366**

Bellisio, Arthur A., Hippocrates G. Psyras, and Marvin M. Fein

STRIPPING OF SULFUR DIOXIDE FROM GAS STREAMS BY USE OF N-ALKYL LACTAMS.

(GAF Corp., New York) U. S. Pat. 3,733,779. 17p., May 22, 1973. 4 refs. (Appl. April 17, 1972, 36 claims).

A process for stripping gas streams containing sulfur dioxide has been developed in which a highly selective SO2 absorbing lactam is employed and recycled for subsequent use. Gas streams containing from 0.05-10% sulfur dioxide by volume are passed at a gas mass flow velocity of 200-3000 lbs/hr/sq ft through a N-methyl pyrrolidone, preferably, contacting zone of 5-85 ft in length to reduce the SO2 content to not more than 250 ppm. Gas streams having SO2 content from 0.01-50% by volume can be thus treated to achieve at least 90% SO2 removal by employing gas temperatures of 35-65 C, preferably. The lactam entrained in the gas stream discharged from the contacting zone is conveniently recovered in a water scrubbing zone, and lactam from the contacting zone and lactam removed from the scrubbing zone are recovered in a distillation zone by heating to 100-200 C. The lactam recovered can be recycled to the contacting zone, and the SO2 stripped from the lactam can be recovered for non-polluting disposal or use. (Author abstract modified)

32091 **APTIC NO. 54636**

Bellisio, Arthur A., Hippocrates G. Psyras, and Marvin M. Fein

PROCESS FOR USING N-ALKYL LACTAMS FOR STRIPPING SULFUR DIOXIDE FROM GAS STREAMS. *(GAF Corp., New York) U. S. Pat. 3,738,086. 18p., June 12, 1973. 6 refs. (Appl. April 17, 1972, 35 claims).*

A process for stripping at least 90% by volume of the sulfur dioxide content of gas streams by the use of an N-alkyl lactam has been achieved without an unacceptable loss of lactam in the discharged stream. The gas stream is passed through an absorption zone containing N-methyl pyrrolidone preferably at a gas mass flow velocity of 200-3000 lbs/hr/sq ft, an absorption zone temperature of 0-75 C, and an absorption zone length of 5-85 ft. The treated gas leaving the absorption zone and containing entrained lactam is passed directly to a water scrubbing zone in which water is fed at a rate of 0.05-2.0 gal/MCF at a temperature of 0-75 C for the removal of at least 90% by weight of the lactam. The water stream from the scrubber zone and the SO2 containing lactam stream from the absorption zone are passed to a distillation zone and heated to 100-200 C to remove SO2 and at least a part of the water content. A lactam-rich stream is recycled from the distillation zone to the absorption zone where an aqueous solution of lactam containing up to 25% by weight of water is maintained. The SO2 removed from the distillation zone is readily recovered for nonpolluting disposal or use. Recycle of the lactam-rich stream ranges from 5-40 gallons of lactam per MCF of gas being treated. (Author abstract modified)

32092 **APTIC NO. 54764**

Bender, R. J

EMISSIONS AND MEASURES AGAINST THEM. DISCUSSED ON HAND OF EXAMPLES FROM THE U.S.A. *(Emissionen und Abhilfen. Beleuchtet am Beispiel USA). Text in German. Oel Gasfeuerung, no. 9:679- 688, 1973.*

A clean waste gas can be realized by a sufficiently complete combustion monitored by specialists with the aid of suitable control units. The combustion should be carried out with a minimum of surplus air which requires optimum mixing of fuel and air with rapid and intense combustion in a nearly blue flame. Dew point increase and sulfur trioxide formation should be kept at a minimum. This method of conducting the combustion process is suitable for both gas and fuel oil. In addition to these measures, dust collection systems should be taken into consideration. The pros and cons concerning such systems are discussed. Of the available dust collectors, electrostatic precipitators, and venturi scrubbers are the most efficient collectors for a broad spectrum of grain sizes. The venturi scrubbers may be twice as expensive in certain cases as electrostatic precipitators. Their economic application depends very much on the individual situation. Among the electrostatic precipitators, a new type with liquid electrodes has gained increasing interest. The dust is electrically charged and settles on the fluid brushing over the electrode plates. The concentration of sulfur compounds in the atmosphere caused by waste gases from combustion processes at present is reduced either by constructing high stacks to safeguard fast dilution or by the use of low-sulfur fuels.

32093 **APTIC NO. 54410**

Blosser, Russell O. and Isaiah Gellman

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS. *TAPPI, 56(9):46-50, Sept. 1973. 7 refs. (Presented at the Sulfite Pulping Conference, Boston, Mass., Oct. 30-Nov. 1, 1972.)*

A brief review is presented of the nature of environmental problems confronting the sulfite industry, the essential characteristics of effluent discharge to water, the alternate approaches being pursued to minimize such discharges, and trends currently evident with the United States industry. Several extended descriptions of selected mill situations are included. The current regulatory agency view, and basis for program action, is that chemical recovery, liquor destruction, or total by-product recovery is a primary requirement. To an increasing extent this requirement is being supplemented by requests for more extensive treatment of residual waste water to the degree represented by at least partial biological treatment. The addition of liquor burning processes has intensified the atmospheric emission control aspects of the industry s environmental protection problems in the areas of both sulfur dioxide and particulate emission control. A number of alternative control methods have evolved for dealing with the selected aspects of the industry s environmental protection problems. The costs associated with both forms of discharge control, added to those for recovery processes, have forced a serious assessment of the future viability of a number of mills. (Author summary modified)

32094 **APTIC NO. 54681**

Bryant, H. S.

ENVIRONMENT NEEDS GUIDE REFINERY SULFUR RECOVERY. *Oil Gas J., 71(13):70-76, March 26, 1973. 28 refs.*

The recovery of sulfur from petroleum refining is following a number of new trends associated with pollution abatement: higher levels of feed contaminants; sulfur-plant catalysis; new control instrumentation; other sulfur-plant design features; and tail-gas cleanup. The increasing trend toward sulfur recovery has had effects on both production rates and on the prices of Frasch sulfur. Description is given of a three-converter sulfur-recovery plant based on the Claus reaction. The recovery of sulfur from refinery-gas streams involves the removal of feed hydrocarbons and ammonia. The former are best handled by minimizing the amount in the Claus plant feed, while the latter may be removed using the waste-water-treating process of Chevron Research Co. or the Ammonex process of Howe Baker Engineers, Inc. Sulfur-plant catalysts fall into two categories: bauxite, often activated by calcining; and activated alumina. The first is lower in cost, while the second has greater surface area and abrasion resistance. Sustained catalization of carbonyl sulfide and carbon disulfide to hydrogen sulfide or S and carbon dioxide can be achieved with cobalt molybdate. The single most important variable in sulfur plant operation is the H2S/SO2 ratio in the gas stream. Control instrumentation is used to monitor these concentrations and adjust the air rates to the various burners, particularly the thermal reactor. Tail gas analysis for H2S and SO2 is generally obtained by chromatographic stream analyzers. Plant design features for reheating the process gas include: hot gas bypass; split flow; steam reheat; gas-to-gas reheat; and no reheat. Another design choice is the number of catalytic converters. The treatment of sulfur-plant tail gas is the most important single trend in the field. Tail-gas-cleanup processes may be classified as continuations of the Claus reaction or as add-on processes of a different nature. The former is less expensive, but the latter provides greater SO2 emission reduction.

32095 **APTIC NO. 55153**

Capriolla, R. L.

ELECTROSTATIC PRECIPITATORS: ANOTHER OPERATOR S VIEW. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 89-92. (March 29-30.)*

Air pollution control by Martin Marietta Cement is summarized with emphasis on wet kilns and baghouses. Martin Marietta Cement has 10 cement producing facilities. Nine plants have kilns and all will be in particulate emission compliance within the dates set by local boards. Five plants are dry process, utilizing baghouses. Two are wet process plants which employ electrostatic precipitators, while two other wet process plants use baghouses. The baghouse operations on a single 2.5 million bbl/yr kiln in Maine has proved out quite well. Without any need to change design parameters, a 450,000 cu ft/min baghouse collector was installed to serve three kilns from a common duct. The high cost of air pollution control has resulted in the shutdown of four kilns, and four others are scheduled for shutdown in the near future. There are other areas in plants where major dust collection units are used. The clinker coolers all formerly employed mechanical collectors which cannot meet the Environmental Protection Agency code. Replacements being considered include electrostatic precipitators along with jet pulse type, high air to cloth ratio baghouses with Nomex bags, glass bag units (at 2.3 to 1 ratio) and gravel bed filters. Specifications for electrostatics and for a baghouses are presented. Their object is to protect the kiln and to minimize kiln down time, which is extremely costly in production fuel economy, and refractory life. The performance of a baghouse is consistent and on line maintenance is possible. The units are more expensive than a precipitator and use more energy to operate.

32096 **APTIC NO. 54325**

Cooperman, P.

ELECTROSTATIC PRECIPITATOR CALCULATIONS BY NOMOGRAM. *Atmos. Environ., 7(8):843-844, Aug. 1973. 2 refs.*

A nomogram for calculation of effective migration velocity or electrode collecting area in an electrostatic precipitator and instructions for its use are presented. The nomogram was constructed and designed to make the calculation with the Deutsch formula for precipitator efficiency easier. The formula is E equals 1 e to the -(omega A)/(V) power, where E is fractional efficiency, omega is effective migration velocity, A is collecting area, and V is gas volume flow rate. With reasonable care, the errors in calculation of omega will usually be under 1% and never will exceed 1.5%. This observation is based on approximately 50 trials and may have to be modified with further experience. The modification may be, however, in the direction of greater rather than lower accuracy, as the trials were made on a rather crudely drawn nomogram.

32097 **APTIC NO. 54765**

Davids P., W. Brocke, H. Gliwa, and F. Baum

POSSIBILITIES FOR REDUCING THE EMISSIONS OF SOOT AND ODORS FROM OIL HEATERS BY PROCESS OPTIMATION AND IMPROVEMENTS OF APPARATUSES. *(Moeglichkeiten zur Auswurfminderung von Russ und Geruchsstoffen aus Oelfeuerungen durch Prozessoptimierung und apparative Verbesserungen). Text in German. Gesundh.-Ingr., 94(9):269-274, 1973. 12 refs.*

The third executive regulation to the emission protection law of the state of North Rhine Westphalia was issued with the purpose of controlling the emission of soot and odors from oil heaters with a nominal heating capacity between 10 and 800 Mcal/hr. The regulation demands that the grey tone produced by a defined sampling method on filter paper may not exceed the soot number three of a comparative scale. The results of such measurements taken on 38,000 heaters (7% of the total number in North Rhine Westphalia) over the heating period 1971/72 were used for determining the dependence of the soot number on the carbon dioxide concentration in the waste gas and on various types of burners. The emission of soot is at a minimum when the CO2 concentration in the waste gas is between 10 and 13%. A simultaneous increase of the efficiency further lowers the emissions. With 66 different types of burners examined, the average CO2 concentration with one exception was below the optimum 10 to 13%. The different results concerning soot number were not so much due to a different design of the various types of burners, but rather to unfavorable CO2 concentrations.

32098 **APTIC NO. 54509**

Decouflet, J. and A. Quillevere

THE INFLUENCE OF AFTERBURNING ON TURBOJET ENGINE-GENERATED POLLUTANT EMISSION. *(L influence de la rechauffe sur l emission des polluants par les turboreacteurs). Text in French. Entropie, 9(51):49-54, May-June 1973. 6 refs.*

Conditions of the generation of harmful emissions in aircraft turbojet engines, and the pollution caused by the afterburning system are reviewed. Carbon monoxide, nitric oxide, and nitrogen dioxide were determined as the chief air pollutants generated by turbojet engines. The NO2 proportion may reach 10% under full load conditions. Carbon particles are formed through the thermal cracking of the fuel aromatic fractions. Large-size turbojet engines are responsible for more nitrogen oxides and for less CO emissions than smaller engines. Afterburner operation causes, under certain flying sequences, especially on civilian supersonic engines, a noticeable additional emission of unburned gases at the nozzle. At some distance downstream of the engine, residual pollution remains moderate because of the unburned gases being oxidized within the external engine jet. The influence of turbulence on the oxidation of CO may be neglected.

32099 **APTIC NO. 54217**

Defalco, A. J.

THERE S NO ODOR HERE. *Water Wastes Eng., 10(9):E8, E10-E11, E16, Sept. 1973.*

Spray irrigation as a method of odor control is discussed and illustrated at a food processing plant. Poor waste disposal at the plant resulted in stagnating 18 acres of forests, fields, and ponds. The odor was immediately curbed by elevating the pH of the field with 20 tons of high calcium hydrated lime and 250 lbs of chlorine. Significant weakness in the plant s pretreatment systems were identified and indicated a need for doubling the primary settling capacity; increasing the indicating/recording pH control systems; and equalizing the material concentrations by dividing the sumps. There are two spray irrigation types available, infiltration and spray runoff. Infiltration includes recharge, ridge, furrow, and flooding basins, and any other method which encourages a downward movement of waste water through soil for treatment. Topography, hydrogeological conditions, and political factors dictated the use of this method. Soil characteristics are of paramount importance in the selection and utimate design of a spray field. Two principal mechanisms that stabilize or convert organic matter applied to soil are those established by the heterogenous biological activity of the soil micro and macroorganisms and the absorptive capacity of the vegetation and soil layers. A spray field must remain aerobic. A critical factor in determining the final capacity of the field is salinity. The salinity tolerance of plants varies widely, but it is generally accepted that dissolved solids concentrations greater than 2000 mg/l are bad for vegetation. An effective spray field must also be rested periodically.

32100 **APTIC NO. 54957**

Dieteren, H. M. L., E. Hallie, and J. J. Mohren

CATALYTIC REDUCTION OF NITRIC OXIDE. *Chem. Ind. (London), no. 18:905-906, Sept. 15, 1973. 3 refs.*

The selective catalytic reduction of nitric oxide with ammonia on a platinum catalyst was demonstrated in a laboratory. Synthetic tail gas was prepared by mixing air and NO2 in a ratio of 200:1. The reactor tube contained 0.5 g of a platinum silica alumina catalyst. Ammonia and tail gas were introduced into the reactor at a rate of, respectively, 4 and 496 cu m/min in order to establish a fluidized bed of catalyst. The carborundum powder was fluidized by flowing air through the powder. The temperature of the carborundum powder was adjusted at 200 C. As a result of the heat liberated during the reaction, the temperature inside the reactor amounted to 220 C. The gaseous reaction products were led through a cyclone and a cooler into a vessel which was connected to the atmosphere. Samples to be analyzed can be extracted from this vessel. Analysis of the reaction mixture was performed by pumping a specified quantity of the mixture through a test tube. Nitric oxide manifested itself by a change of color. The degree of change of color indicated the concentration of NO2 present in the reaction mixture.

32101 **APTIC NO. 54388**

Edgar, W. D. and T. C. Mullen

COKEMAKING: PROGRESS AND DEVELOPMENT IN ATMOSPHERIC POLLUTION CONTROL EQUIPMENT--PART 1. *Steel Times (London), 201(7): 545-549, July 1973. 10 refs. (Presented at the Coke Oven Managers Association, Northerm Section, Durham, N. C. Nov. 23, 1972.)*

Pollution control in smokeless charging systems used in cokemaking are reviewed. There are three types of smokeless charging systems. There are variations on convention charging; there are systems using cars fitted with devices to collect and clean the emissions, and there is pipeline charging. The sequential charging system is the simplest and cheapest method available; it depends on dropping the coal bins in a predetermined sequence, each lid being replaced after charging has taken place on that charge hole. Other methods include: the double means system; methods using existing larry car equipment with modifications such as breeches pipes; and the American Iron and Steel Institute s charging system in which the openings through which smoke can escape are minimized, while suction is maintained at all times in the free space along the top of the oven. The second type of pollution control in charging depends on having equipment on the charger to collect and clean emissions. The differences lie in the method of scrubbing the gases and in the number of scrubbers used. Pipeline charging eliminates oven charging. Preheated coal with steam as a carrier is fed into the oven through pipes above the ram side oven doors.

32102 **APTIC NO. 54389**

Edgar, W. D. and T. C. Mullen

COKEMAKING: PROGRESS AND DEVELOPMENT IN ATMOSPHERIC POLLUTION CONTROL EQUIPMENT--PART 2. *Steel Times (London), 201(8): 591-595, Aug. 1973. 6 refs. (Presented at the Coke Oven Magers Association, Northern Section, Durham, N. C., Nov. 23, 1972.)*

Progress and development in atmospheric pollution control equipment in cokemaking are reviewed. Three types of coke side emission control systems appear viable. First, systems where the guide is enclosed and an associated hood provided with scrubbers and fans covers the coke car during pushing. Secondly, systems where a hood and guide enclosure is connected to a duct which conveys emissions to a static washer and fan. Thirdly, systems where the coke is pushed through an enclosed guide into a fully enclosed coke car, the washers and fans being mounted on the coke car. Coke quenching is another source of intermittent emissions. When quenching water includes by-product plant wastes, heavy corrosion can occur in surrounding areas. Many authorities now specify that quenching water must be of a quality that could be discharged into rivers without adding to water pollution. Other less important intermittent emissions can occur when coal spillage on the battery top is swept into empty ovens and during the routine cleaning of the collecting main. Spillage can be reduced by better charging hole alignment and well-fitted larry car drop sleeves. Continous emissions from a battery attract less attention because their cure lies in good detailed design and plant operation and maintenance rather than any novel control scheme.

32103 **APTIC NO. 54183**

Eguchi, Yoshitomo

GENERAL REMARKS -- THE PROPERTIES OF ACTIVATED CARBON AND ITS USE. *(Soron -- kasseitan no seino to sono riyo). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, Kanto Branch p. 1-11, 1973. (Presented at the Japan Society of Chemical Engineering, Study Meeting, 66th, Tokyo, Japan, Sept. 21, 1973.)*

The basic characteristics of activated carbon are discussed including density, grain density, filling density, void, micro-pore volume, surface area, distribution of micro-pores in different adsorbents, adsorpton of various hydrocarbons on activated carbon, characteristics of molecular sieving carbon such as the adsorption of water and nitrogen, single-component equilibrium adsorption of ethane and ethylene, and mixing adsorption of normal hexane and isooctane. The applications of activated carbon are discussed such as desulfurization of smoke, prevention of gasoline evaporation in a car, removal of radioactive substances, air cleaning, deodorization, and application to catalytic reactions.

32104 **APTIC NO. 54973**

Ellerbe, R. W.

DESIGN BASIS FOR A NEARLY ODOR-FREE KRAFT PULP MILL. *Paper Trade J., 157(42):36-40, Oct. 15, 1973. 13 refs.*

A design basis for nearly odor free kraft pulp mills is presented which is capable of reducing total reduced sulfur emissions by about 90%. The design typically includes black liquor oxidation or low-odor recovery boilers, burning of digester and evaporator malodors in the lime kiln, and scrubbing tall oil plant vents. The characteristic kraft odor is caused predominantly by several low molecular weight compounds, including hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. New recovery furnaces, exclusive of the cascade evaporator, can generally be operated at hydrogen sulfide levels below 5 ppm, and emissions from properly operated low-odor recovery boilers can be as low as 0.1 lb sulfur/ton air dry pulp; emissions from black liquor oxidation systems amount to 0.3 lb sulfur/ton of sulfur pulp. Thermal oxidation of digester non-condensible gases in the lime kiln is the most practical route to the elimination of such maladors, and digester non-condensible gas flows of about 300 cf and 2.5 lb sulfur/ton pulp appear to be a reasonable design basis. Evaporator malodors are usually combined with those from digesters for burning in the lime kiln; an appropriate design basis is 0.3 lb sulfur loss/ton pulp and 160 cf/ton pulp. Tall oil emissions can be effectively reduced by application of packed bed scrubbers; any alkaline scrubbing medium will effect a 99.9% removal of hydrogen sulfide, the major constituent. Rather remarkable sulfidity increases occur when 90% of the volatile sulfur losses are eliminated by the above methods. Caustic soda or soda ash as a partial replacement for the saltcake ordinarily used are employed as common practice.

32105 **APTIC NO. 54600**

Engels, Lothar-H.

DUST SEPARATION TECHNIQUES: PROCEDURES, PERFORMANCE, AND EXPENDITURES. *(Entstaubungstechnik: Verfahren - Leistung - Aufwand). Text in German. Tue (Tech. Uebewach.), 14(8):224-229, Aug. 1973.*

Available dust separation techniqes and equipment are surveyed. Among the mechanical dust separators, settling chambers, impact separators and deflectors have gone out of use almost completely, while the efficiency of cyclones has been improved through reducing the cyclone diameters and the use of a multiplicity of cells. Wet type dust separators adopting irrigation, washing, or spray technique are used in a great variety of industries. They are especially suitable for short-term dust removal operation in hot furnace gases in metallurgical plants. Filter separators have experienced an extension of their field of application since the introduction of heat-resistant, synthetic filter materials. Dedusting is done by knocking, vibration, or counterflow. Electrostatic dust precipitators, operating with negative d. c. voltages of 15,000 to 80,000 volts, can be designed either in vertical or horizontal layout for dry and wet operation equally. The actual dust separation technique and dust separator should be selected as a function of technological characteristics, mode of operation, nature, concentraion and particle size distribution of the dust to be separated, the temperature and humidity of the carrier gas, the desired and required efficiency, and the possible reuse of the separated dust.

32106 **APTIC NO. 55289**

Ezaki, Masanno and Tadashi Kuragano

REMOVAL OF NITROGEN OXIDES BY A DRY TYPE CATALYTIC REDUCTION METHOD. *(Kanshiki sankachisso no jokyo -- sesshokukangenho). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(5):646-651, Nov. 1973. 10 refs.*

A large number of wet type or dry smoke denitration techniques have been proposed, but due to the difficulty of the wet absorption of nitric oxide, the wet type absorption method for nitrogen oxides has not been used, in contrast with desulfurization. The dry denitration method has advantages in that its process is comparatively simple and no by-product is formed due to the decomposition of nitrogen oxides. The selective denitration technique using ammonia as a reducing agent is considered a most promising process for treating a great amount of exhaust gas. The dry denitration technique using ammonia is being developed. Sumitomo Chemical Co. is developing removal equipment intended for the denitration of reformer exhaust gas with removal efficiency of 70 to 80%. The Agency of Industrial Science and Technology announced a copper oxide-gamma alumina catalyst having a 99% nitrogen oxide decomposition rate. Hitachi is developing an iron-base nickel oxide catalyst having more than 80% NOx removal efficiency.

32107 **APTIC NO. 54585**

Fernandes, J. H. and L. J. Cohan

BURNING OF WASTES AS FUELS IN INDUSTRIAL BOILERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1973. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-227.)*

Various gaseous, liquid, and solid wastes from municipal and industrial sources can be used as fuel in specially designed steam generating units to produce a valuable by-product, steam. Most gaseous and liquid waste fuels require a minimum of preparation aside from storage and, perhaps, chemical treatment Solid wastes must be received, mixed, and stored properly. From storage, they may be shredded and separated if necessary. Certain types of industrial wastes may present special problems. The residuals and sludges from various industrial processes and sewage plants require special incinerator designs for proper incineration and pollution control, and the black liquor from pulp mills requires the use of a chemical recovery unit with steam generation being of secondary importance. If proper combustion control is applied with minimum excess air and indirect cooling using steam generation, the volume of gas to be handled by the factory s air pollution control equipment can be reduced substantially, thereby nearly offsetting the cost of the steam generating equipment. If the steam can be used in the process, it will justify the boiler cost. Examples of incineration with steam generation include: the incineration in a properly designed boiler of blast furnace gas from the steelmaking process; the incineration of paper mill liquors in shop assembled boilers equipped with Loddy furnaces; and the incineration of shredded refuse in a 180 tons/day refuse and sludge-fired unit. The designs of these special incinerators are such that the effluents from the burning process are free from pollutants.

32108 **APTIC NO. 54576**

First, Melvin W., Walter Schilling, J. H. Govan, and Alan H. Quinby

CONTROL OF ODORS AND AEROSOLS FROM SPENT GRAIN DRYERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 37p., 1973. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-274.)*

The spent grain generated by the grain processing industries are generally dried and used as feed stock. The effluent gases generated by the dringy operations contain water vapor, combustion gases, grain dust, condensible vapors, and odorous noncondensible vapors. Effluent control methods which have been studied include gas incineration, adsorption on charcoal, conversion to nonodorous compounds by ozone, and absorption in reactive scrubbing solutions: these methods have proved to be impractical, expensive, and/or ineffective. A new technique was investigated which used gas phase reaction as a conditioning step preceding absorption in a chemically reactive solution. A caustic scrubber unit containing an impingement stage to remove particulate matter, wetted fiber stages to remove absorbable gases, and a dry fiber stage to prevent droplet carryover to the stack was employed. Chlorine gas was added to the dryer effluent gases to enable the water insoluble components to react and become water soluble before reaching the caustic scrubber. Pilot scale studies conducted at distilleries indicated that the new method achieved excellent particulate and odor reduction. A full-scale unit has since been installed in a distillery, where it works continuously to handle the gas flow from two natural gas-fired direct heat rotary grain dryers. It has performed exactly as the pilot tests predicted and has proved to be economical. This technique can also be used to handle the odorous emissions associated with other food waste processing industries, including rendering and fish and poultry meal production.

32109 **APTIC NO. 55190**

Flegal, R. C. and N. J. Gahr

SUMMARY OF DEMONSTRATION METHODS FOR EXTINGUISHING CULM-BANK FIRES. *Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, APTD-1518, 54p., July 1973.*

NTIS: PB 222836

Sealing, grouting, and mechanical-hydraulic methods of extinguishing burning coal-refuse banks were evaluated in three states of the Appalachian region of the United States. Both effectiveness and unit cost were major considerations in the evaluation. Mechanical-hydraulic methods were the most successful procedures in terms of effectiveness and economy;

they completely extinguished the fires and had a moderate unit cost of $0.66 to $2.99/cu yd of material treated. These methods, however, require large quantities of water and a large disposal area; these conditions are not always present at burning culm-bank sites. The wide diversity of coal-refuse-bank sizes, shapes, compositions, and locations makes the selection of a universally recommended control method impossible. (Author summary modified)

32110 **APTIC NO. 54620**

Fleming, A. K.

AIR POLLUTION CONTROL IN THE NEW ZEALAND MEAT INDUSTRY. *Clean Air (J. Clean Air Soc. Australia New Zealand), 7(2):33-35, May 1973. 7 refs.*

The New Zealand meat industry had recently adopted methods of effective odor control for its rendering operations, while simultaneously emphasizing the economy associated with heat recovery from waste steam vented from rendering cookers. Fume removal plants have now abandoned jet condensers in favor of surface or indirect condensers coupled with hot water recovery, storage, and reticulation systems operating at temperatures up to 85 C. Installation costs for a complete heat recovery and odor elimination plant range from $21,000 to $84,000, depending on the installation size required. Residual noncondensable gases have been measured at concentrations of 0.01 to 1.0% by volume, although figures as high as 5% have been reported, possibly due to air infiltration. A review of some of the more acceptable methods for elimination of these odors includes: dispersal; flame oxidation (1400 C and above); hot surface oxidation (500-800 C); catalytic oxidation (300-500 C); chemical oxidation using ozone, chlorine, chlorine dioxide, hypochlorites, or permangnates; absorption; adsorption; and masking and counteraction. Rendering fumes have been effectively controlled by flame oxidation where proximity of the rendering department to the boilers makes this feasible. Catalytic oxidation has not been adopted in New Zealand thus far. Regeneration of activated carbon in adsorption processes does not appear feasible because of the prohibitive cost involved in retorting at 600 C in the absence of air to remove the strongly attached organic compounds of high molecular weight.

32111 **APTIC NO. 54330**

Fukushima, Shozo

REMOVAL OF COMBUSTIBLE EXHAUST GASES BY CATALYTIC OXIDATION. *(Shokubai sankaho ni yoru haiki shori gijutsu). Text in Japanese. Preprint, Kogai Kenkyu Taisaku Center, Tokyo, p. 11-42, 1973. (Presented at the Seminar on Practice and Application of Bad Odor Countermeasure Techniques, Tokyo, Japan, Aug. 1-2, 1973.)*

Catalytic oxidation can be used to remove combustion exhaust gases. Platinum-alumina and oxides of copper, chromium, manganese, cobalt, and nickel can be used as catalysts. About 200 l of catalysts handles 100 cu m/hr of exhaust gas at 350 C. The combustible gases must be adjusted to less than 40% and 25% concentration of the minimum explosion limit concentration (about 1.4%) for automatic operation and manual handling, respectively. Useless dilution of the exhaust gas increases the installation cost. The installation costs for removal of 1500 ppm of combustible components in 600 cu m/hr of exhaust gas is 4000 dollars, while 9000 dollars is needed for 1800 cu m/hr of gas containing 500 ppm gases. Safety methods, alarm systems, toxicity, and efficiency of catalysts are discussed.

32112 **APTIC NO. 54883**

Fukuta, M.

COMBUSTION SMOKE CONTROL TECHNOLOGY. *(Nensho baien boshi gijutsu). Text in Japanese. Seikatsu Eisei. (J. Urban Living Health Assoc.), 17(4):120-132, April 1973. 4 refs.*

Cost, reliability, accessibility, and boiler damage should be considered in the selection of a desulfurization system. Wet systems are rapid and produce high desulfurization giving the advantage of reducing plant size, but they also lower the temperature of exhaust gas, and have corrosion problems. Dry systems have the opposite effect. A wet lime system used calcium carbonate or oxides to absorb sulfur dioxide, and in a dry lime system the CaCl3 is applied directly to the boiler system. In a semi-wet system, the limestone powder is blown into the combustion chamber, and the lime is reused by adding water in a reaction with SO2. Alkalized alumina systems use sodium aluminate powder, and the Mangan system uses manganese hydroxide. The active carbon system adsorbs SO2 on a fixed bed of active carbon at 100-150 C, and absorbed SO2 is recovered as sulfuric acid.

32113 **APTIC NO. 54274**

Gappa, Gunther, Karl Knoblauch, Franz Maier, Jurgen Schwarte, and Peter Steiner

PROCESS FOR REMOVING SULFUR OXIDES FROM SULFUR OXIDE CONTAINING EXHAUST GAS. *(Bergwerksverband G.m.b.H., Essen (West Germany)) U. S. Pat. 3,717,976. 4p., Feb. 27, 1973. 2 refs. (Appl. Oct. 22, 1971, 5 claims).*

A process for the removal of sulfur oxides from water vapor-, steam-, and oxygen-containing exhaust gases, particularly from power plant exhaust gases, has been improved by lowering the amount of adsorption material required to produce a constant average degree of desulfurizing in the exhaust gas: adsorption of sulfur oxides onto granular carbon-containing material has also been improved by increasing the sulfur oxide loading of the adsorption material. A portion of the exhaust gas which has been introduced into a reactor for desulfurization is taken off after it has passed through the upper part of the reactor only. The remaining gas is removed only after its passage transversely through the moving bed of carbon containing adsorption material and after it has reached the bottom of the reactor. This latter portion of gas is subjected to an after-desulfurization treatment, preferably in a second moving bed reactor. Division of the exhaust gas stream allows for good yields, and the portion of the gas which is taken from the upper portion of the reactor amounts to 30 to 90% (by volume) of the total gas stream. The exact volume percent which is taken off the top is adjusted in accordance with the sulfur oxide content of the exhaust gases, its flow velocity, the adsorption capability of the adsorption material, its rate of movement, and the diameter of the moving bed.

32114 **APTIC NO. 55103**

Gardenier, H. E.

A MANUFACTURER S VIEW OF SCRUBBER COLLECTORS. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 7-18. (March 29-30.)*

The wet scrubber market is discussed from the manufacturer s point of view. The wet scrubber portion of the air pollution control market has been traditionally approximately 20%. A manufacturer s view of the scrubber collectors must necessarily be heavily influence by a desire to expand this share of the market. The most frequent criticisms of wet collectors are the high power consumption for small particle removal, high fan maintenance costs, high noise level, and water pollution problems. Some of the well known advantages of wet collector systems are the lower capital investment in equipment, ability to function over a wide gas temperature range, ability to remove certain gaseous pollutants, and small physical size. Some progress has been made in developing new markets for wet scrubbers with high collection efficiency. Specifically in the ferro-alloy industry and in the coke producing industry. The ferro-alloy industry has a particularly difficult emission control problem because most of the emission is silicon dioxide. The particle size distribution of this material is 100% less than 0.5 and more than 80% less than 0.1 micron. The particles have a low density, a very low settling rate, and are highly visible for many miles. Properly designed scrubbers can provide satisfactory emission controls. The number of coke oven emission control systems operating in the United States is very limited, but a prototype scrubber for coke over pushing emissions is being placed in operation in Chicago. (Author summary modified)

32115 **APTIC NO. 54873**

Hagemann, Henner, Erwin Ahland, and Werner Peters

DUST CLEANING OF WASTE GASES FROM WATER-TUBE BOILERS FIRED WITH PULVERIZED COAL. *(Abgasentstaubung von mit Steinkohlenstaub gefeuerten Wasserrohrkesseln). Text in German. Staub, Reinhaltung Luft, 33(9):367-372, Sept. 1973.*

In an experimental plant comprising two complete water-tube boiler units, tests were carried out concerning dust cleaning of waste gases. The boilers were fired with hard coal pulverized to different fineness. The two Lamont boilers were designed for a steam capacity of 10 t/hr with 120 atm gauge and 500 C. The boilers were followed by the Ljunstroem air preheater and a combined dust collection system comprising a multicyclone, a horizontal electrostatic precipitator, and a further multicyclone. An experimental plant for flue gas desulfurization by the process developed by the Bergbau Forschung GmbH was also connected. The extent of pulverization strongly influenced the performance of the dust collectors. The collection efficiency dropped with finer grain sizes. The collection efficiency of the electrostatic precipitator improved with up to 15% unburned matter in the fly dust. Between 15 and 30% no further improvement was observed, and with more than 30% unburned matter the collection efficiency dropped markedly. The automatic voltage control in the electrostatic precipitator also had a positive effect on the collection efficiency and the adequate adjustment of the rapping of collection electrodes. In the case of insufficient separation in an electrostatic precipitator, the installation of a multicyclone is justified. Otherwise it is too expensive. For the continuously-recording dust-density measuring units installed in the cleaned gas duct, calibration curves are given.

32116 **APTIC NO. 55288**

Hanai, Satoshi, Yasuichi Sato, Tetsu Sakamoto, and Takashi Hotta

MOLDABILITY OF STAINLESS STEEL PLATE FOR CAR EXHAUST DISPOSER. *(Jidosha haikigasu shorikiyo sutenresu koban no seikeisei). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 161-164, 1973. (Presented at the Joint Lecture Meeting on Plastic Processing, 24th, Okayama, Japan, Nov. 4-6, 1973.)*

An evaluation was made for the ferrite series heat resistant steel plate as a material for car exhaust cleaning equipment to provide guiding data for the design of proper material. The materials used in this experiment cover the low carbon iron-chromium- aluminum series steel plates, usual stainless steel plates on the market, common soft steel plates, and austenite series steel plates. These materials were formed into cylindrical, oval, and semicircular shapes, and the molding limitation of these shapes was investigated. As a result, the break limit curve obtained showed that the austenite series stainless steel showed an excellent limit value, and the cylinder moldability showed that the low carbon Fe-Cr-Al series steel plate showed a possibility of the design of a high R value. As for the oval moldability, the low carbon Fe-Cr-Al series steel plate showed that as the axis ratio of oval shape is larger, the maximum depth becomes correspondingly larger; the austenite steel plate showed that the maximum depth does not vary according to the class of steel and the strength of material. The ferrite steel plate, soft steel plate, and Fe-Cr-Al series steel plate showed marked deterioration of the elongation flange property.

32117 **APTIC NO. 54329**

Higuchi, Kozo

ODOR GAS REMOVAL BY ADSORPTION METHOD. *(Kyuchakuho ni yoru akushu boshi gijutsu). Text in Japanese. Preprint, Kogai Kenkyu Taisaku Center, Tokyo, p. 43-63, 1973. (Presented at the Seminar on Practice and Application of Bad Odor Countermeasure Techniques, Tokyo, Japan, Aug. 1-2, 1973.)*

The removal of odors by adsorption on activated carbon is often used since carbon can adsorb as much as 0.1-0.4 parts of its own weight. Sulfonated coal is used to remove basic gases and LMN is used to remove acidic gases. A typical deodorization process consists of a cooling tower, two scrubbers, and one adsorption tower containing 2.2-6.5 tons of LMN, 4.3-12.9 tons of sulfonated coal, and 1-3 tons of activated carbon. The exhaust gas is cooled, dust is removed from the first tower, acidic and basic gases are scrubbed from the gases, and other gases are adsorbed as the gas enters the adsorption tower at 100-300 cu m/min. The adsorbent lifetime equals 1,000,000 times the adsorbent efficiency times the adsorptive capacity, times the weight of the adsorbent divided by the flow rate and the odor concentration.

32118 **APTIC NO. 55043**

Hoad, John G.

SCRUBBER COLLECTORS FROM THE VIEWPOINT OF THE CONSULTING AND DESIGN ENGINEER. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 25-29. (March 29-30.)*

Problem definition in scrubber collectors is discussed from the viewpoint of the consulting and design engineer. It is impossible to overestimate the underlaying importance of proper problem definition. A systems engineering approach is used as part of the definition stage to see if acceptable process of manufacturing changes, or shifts to different materials, or modifications to present equipment or machinery would make the problem smaller, or more easy to control, or to eliminate it altogether. Areas to investigate in determining the problem include: the volume of gas to be treated in both actual and standard cfm; the temperature range of the gas; particulate loading and related size distribution curves, particle density, shape and shape factors, and wettability by scrubbing medium. Scrubbers should usually be viewed as an essential part of a chemically oriented emission control system. There should be a rigorous sampling and testing program to establish: solid phase characteristics as the chemistry of the particulate matter; possible chemical interaction with the scrubbing medium with resultant scaling, corrosion, and plugging; analysis of the gas phase characteristics as molecular weight, density versus temperature and pressure, chemical interaction of gases with the scrubbing medium; the effect of temperature and/or pressure drop on gas phase components; other effects which could result in plugging corrosion, scaling, and other difficulties; and vapor plume.

32119 **APTIC NO. 54543**

Hoffmann, Gerd W. and Otto Meyer

PRACTICAL EXPERIENCE IN THE DEDUSTING OF WASTE GASES CONTAINING CO FROM TOP-BLOWING OXYGEN CONVERTERS USING DRY ELECTROSTATIC PRECIPITATORS. *(Betriebliche Erfahrungen mit der Entstaubung kohlenmonoxidhaltiger Abgase aus Sauerstoof aufblaskonvertern mit Trockenelektrofilter). Text in German. Stahl Eisen (Duesseldorf), 93(20):905-910, Sept. 27, 1973.*

The Salzgitter steel works in West Germany selected the minimum gas method with dust cleaning by electrostatic precipitators mainly because of lack of space. Had a full combustion, with its much higher waste gas quantity, or a wet gas cleaning method been selected, more space would have been required. With the minimum gas method, 1.5 cu m waste gas develop/cu m of converter gas vs. 3.5 cu m with full combustion. First tests were performed with a tube-type dry electrostatic precipitator, but the facility did not prove safe enough. A three-stage dry plate electrostatic precipitator was therefore installed. The heat liberated by cooling the waste gases to 200 C is utilized in a waste heat boiler. The horizontal three-stage electrostatic precipitator has a diameter of 10.7 m and a length of 33.6 m. Through external isolation of the filter casing, the wall temperature is maintained at a level which renders any drop below the dew point impossible. The clean waste gases are drawn off by a blower and burned in a flare at the end of a 65 m high stack. The installations for dust collection in converters A and C differ in their cooling path and the position of the connecting pipe for the uncleaned gas between converter and cleaning installations. Detailed analyses of the gas composition prior to and after dust cleaning were performed. The design of converter A provides more opportunity for a mixing of carbon monoxide with oxygen within thy explosive range, while in converter C no explosive mixtures occurred. The temperature and the hydrogen concentration have an influence on the explosion limits. The H2 fraction increases with increasing CO fraction because of the water gas reaction. As a consequence, the explosion limit drops. Both installations reduced the dust concentration to 85 mg/cu m which corresponds to a collection efficiency of 99.95%.

32120 **APTIC NO. 55152**

Hubbard, R. F.

FABRIC FILTERS: ANOTHER OPERATOR S VIEW. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 123-127. (March 29-30.)*

The operation and maintenance of fabric filters in the grain industry as experienced by Cargill, Inc., are discussed. The determination of air to cloth ratio is a basic requirement. The grain industry must consider emission requirements, dust acidity, dust moisture, ambient air humidity, and particle size distribution. Local emission codes and the type of neighborhood in which a facility is located determine the degree of filtration required. Considering only humidity, Cargill design 10-12 air to cloth ratio for high humidity and 12-18 for low humidity. Life of filter bags depends on the design of the member which holds the filter bag and the method of cleaning the bag in the filter operation. The pressure drop across the filter is a reliable indication of media condition. Basic design in keeping moving parts to a minimum, keeping them on the clean air side of the filter, and consideration of the required longevity is important to the operator. Cycling the filter after the operation has been shut down until the bags are clean will prevent the filter cake from dropping and plugging the discharge during shutdown periods.

32121 **APTIC NO. 55028**

Hubbert, G.

WET COLLECTOR DESIGN, OPERATION AND MAINTENANCE. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 31-35. (March 29-30.)*

The types, operations, and maintenance of wet collectors are discussed. The objective of a wet collector is to capture dust particles within large water droplets which can easily be eliminated from the air stream. There are basically two types of wet scrubbers. The first is a medium pressure drop or medium energy scrubber where the pressure drop across the unit is in the range of 5 to 6 in. water gauge. The second type is a high energy type where the pressure drop is above 10 in. water gauge from inlet flange to the outlet flange of the collector. Medium energy wet collectors include centrifugal collectors, dynamic types, and orifice types. The high energy types are the fog spray and the venturi scrubbers. A comparison of the major types of wet collectors from the standpoint of operating and efficiency characteristics is presented. The two most common problems encountered in wet collectors are abrasion and corrosion. Other problems may result from auxiliary equipment.

32122 **APTIC NO. 54538**

Huch, Reinhold

PRESENT TECHNICAL POSSIBILITIES FOR REDUCING EMISSIONS FROM ANIMAL BREEDING STATIONS. *(Stand der technischen Moeglichkeiten zur Emissionsminderung bei Tierhaltungsbetrieben). Text in German. Wasser Luft Betrieb, 17(9):302-305, 1973.*

Measures for the reduction of emissions of odors from animal breeding places must concentrate on the sheds were the animals are kept and on the systems of manure storage, treatment, and disposal. In the sheds air quantity and air velocity must be controlled in a way which satisfies the animals demand for cooling in summer and which at the same time keeps the humidity and waste gases in the shed at a minimum. This goal is achieved by sufficient supply of fresh air. The waste air should be conducted off at least in 7 m height. No lateral outlets are admissible. Highly loaded waste gases can be cleaned by scrubbing. The biological oxidation of liquid manure underneath the shed is of advantage because the manure has no opportunity for an anaerobic decomposition and can be stored largely odor-free. The addition of chemicals to the manure may help to lessen odors provided their use has no other harmful effects upon application of the manure on fields.

32123 **APTIC NO. 55045**

Huelsen, W. B.

FABRIC FILTERS: AN OPERATOR S VIEW. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 119-122. (March 29-30.)*

User problems in air pollution control equipment are discussed. The design engineer and equipment manufacturer are usually the same person which makes the designer manufacturer (D/M) a single source of responsibility. The user expects the D/M to have an understanding of the process to be controlled, as well as the problems that must be overcome in providing a successful installation. The user is responsible for evaluating the D/M s competence, capability, and experience background, and should do this before entering into any binding agreement. The potential user should assure himself that the D/M has a long term commitment to remain interested and active in pollution control problems. Both user and D/M should investigate the others financial responsibility and capability. In evaluating a quotation, the final installation cost should be understood. Atmospheric noise itself is an air pollutant and certain well defined limitations are specified in many jurisdictions. The noise problem and requirements of the Occupational Safety and Health Act of 1970 should be thoroughly discussed by the D/M and user during preliminary negotiations and an agreement reached as to whose responsibility they are and to what extent remedial measures may be required. Companies should be sure that purchase contract agreements for air pollution control installations are carefully drawn, with legal assistance, and that all supplementary contract agreements are reviewed by counsel before being finalized. Until the Air Pollution Control Agency issues a permit for operation on a particular air pollution control device, that installation cannot be considered complete. Recognition of this fact should be included in the financial agreement worked out between the D/M and users.

32124 **APTIC NO. 54381**

Hungate, Ernest C., Harold A. Ogletree, and Grason T. Nickell

POLLUTION CONTROL METHOD AND APPARATUS. *(Air Conditioning Corp., Greensboro, N. C.) U. S. Pat.*

3,733,778. 8p., May 22, 1973. 5 refs. (Appl. May 1, 1972, 9 claims).

A high-velocity type spray chamber air conditioning apparatus for controlling the emission of odors and particulate matter for example from rendering and meat-packing plants has been designed which is highly efficient, low in cost, and high in capacity. The method consists of passing a source gas through a chamber containing a densely sprayed chemical solution which contacts the gas at a high contact efficiency to collect and suspend particulate matter in solution and absorb odors. The gas is again contacted with the solution while the chemical solution is separated from the cleaned gas. The method may also include the step of creating a uniform gas velocity prior to treatment; and, in an alternate embodiment, the gas may be subjected to several spraying treatments with the same or different solutions. Specific solutions disclosed include solutions of water with sodium carbonate, sodium bisulfite, sodium hydroxide, chlorine dioxide, potassium permanganate, and calcium hypochlorite. Chlorine gas may also be introduced into the air stream for the same purpose. The method may also be practiced using several sequential treatments of different solutions in each of the subsequent stages. The optimum range of gas velocity for practicing the method is 1000-3000 ft/min, and units for practicing the invention range in size from 38,000-150,000 cu ft/min.

32125 **APTIC NO. 54531**

Huntington, Richard L.

INCINERATOR AFTERBURNER PARTICULATE EMISSION FACTORS: A CORRELATION AND COMBUSTION STUDY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1973. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-226.)*

An incinerator afterburner emission factor equation was derived based upon chemical reaction rate kinetics. This equation compared favorably with observed emission factor test data and the available literature. The chemical reactions involved in the combustion process and in smoke formation were compared thermodynamically to observed combustion rate constants. Smoke-producing reactions were investigated and indicated that both carbon dioxide and water play an important part in determining the reactivity of primary chamber particulate smoke emissions when burned in the secondary afterburner chamber and in the overall combustion process. The acceleration effect of moisture and CO2 on the combustion process was attributed to the reversible water gas reaction. Both CO2 and water served as oxidizing agents at high temperatures. A combustion reaction phase diagram for the formation and destruction of smoke was prepared and used to establish minimum smoke formation and combustion temperatures. Equivalent minimum combustion zone residence time, excess air and combustion zone temperature combinations are presented in graphic form. (Author abstract)

32126 **APTIC NO. 54774**

Huntington, Richard L.

FLUE GAS RECOVERY METHOD AND APPARATUS. *(Assignee not given.) U. S. Pat. 3,733,777. 9p., May 22, 1973. 6 refs. (Appl. June 10, 1971, 23 claims).*

An economical process for the recovery of waste gas such as sulfur dioxide from flue gas employs direct contact packed-bed heat exchangers, a packed bed absorber and desorber, and packed bed liquid-liquid heat exchangers of improved design. It utilizes the thermal energy of the hot flue gas to desorb sulfur dioxide, preheat combustion air, and to reheat absorber tail gas; the formation of a vapor plume and loss in stack gas draft are minimized by operating the absorber at low temperatures and by reheating the absorber tail gases. Operationally, heat is extracted from the hot flue gas and cooled by direct contact with an immiscible heat transfer fluid in a packed bed. Moisture is condensed from the flue gas by direct contact with cold heat transfer fluid and separated from the fluid by decantation. Sulfur dioxide is absorbed from the cooled flue gas in a packed bed by direct contact with a cold aqueous sulfite solution to form a bisulfite salt solution. The aqueous bisulfite salt solution is thermally decomposed, and the sulfur dioxide is desorbed by heating through direct contact with a partially water-miscible organic acid-containing, high temperature heat transfer fluid from the initial flue gas cooling step. Heat is recovered from the stripped sulfite absorption solution by direct contact with heat transfer fluid and used to preheat combustion air. Improved absorber design is based upon the use of slant packed beds, slant inlet-outlet packed bed access parts, and slant packed bed tower internals for reduced bed clogging, reduced absorber height, and ease of packing replacement while the absorbers are in use.

32127 **APTIC NO. 54411**

Jancso, Tibor

ENVIRONMENTAL POLLUTION PROBLEMS IN THE PETROLEUM INDUSTRY. *(A koolajipar kornyezetszennyezesenek problemai). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):240-245, 1973. 7 refs.*

General problems of environmental pollution in, and possibilities of the petroleum industry to abate air pollution are discussed. Most crude oils contain 3 to 5% sulfur and nitrogen compounds. The tendency of increasing proportion of sulfur with increasing boiling point of the petroleum fractions was observed. Gasoline, diesel oil, and heating oil are desulfurized at 400-420 C and under 40-50 atm by means of a cobalt-molybdenum catalyst on alumina support in hydrogen cycle. The desulfurization of heavy fuel oils is, however, both problematic and expensive. Petroleum refining processes, due to being conducted in a closed cycle, generate minor, and local, air pollution only. Increasing the octane rating of the gasoline with simultaneous reduction of the lead content represents a major concern of the petroleum industry. Flue gas desulfurization is claimed to be possible by the Shell process in which the waste gas is contacted with copper or copper oxide on activated alumina support. The sulfur dioxide present in the flue gas is converted into copper sulfate which is then regenerated to obtain highly concentrated SO2 that is now suitable for processing to elmentary sulfur.

32128 **APTIC NO. 54510**

Jonakin, James

DAMPER-ROD SCRUBBER. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,730,499. 4p., May 1, 1973. 5 refs. (Appl. July 21, 1971, 4 claims).*

A wet scrubber for removing impurities from dirty gases and which can be effectively removed from the exhaust gas flow is described. The scrubber utilizes a plurality of scrubber rod beds, any one or all of which can be rotated 90 deg to a position where the rods are parallel to the flow of gases, thereby effectively removing them from the gas stream. The rods are removably secured so that the width of the slits between the rods can be varied. (Author summary modified)

32129 **APTIC NO. 54766**

Juentgen, Harald, Karl Knoblauch, and Dieter Zuendorf

TECHNICAL TRIALS ON ACTIVATED COKE FROM COAL FOR ADSORPTIVE WASTE GAS DESULFURIZATION WITH INTEGRATED THERMAL REGENERATION. *(Technische Erprobung von Aktivkoks aus Steinkohle fuer eine adsorptive Abgasentschwefelung mit integrieter thermischer Regeneration). Text in German. Chem.-Ing. Tech., 45(19):1148-1151, 1973. 11 refs.*

The waste gases produced on combustion of fossil fuels can be desulfurized above their dew points in the temperature range 120-180 C by use of carbonaceous adsorbents. This avoids cooling during the gas purification washing process and the attendant corrosion damage. The sulfur dioxide was absorbed on activated coke travelling slowly from top to bottom in a reactor. At the bottom of the reactor the loaded coke is drawn off, regenerated at 600 C, and returned to the reactor. Carbon loss changed the inner structure of the coke. Narrow adsorption pores developed where the SO2 was retained. The SO2 load increased steadily in this state. Through partial gasing, the activated coke lost its mechanic strength. Erosion and replenishment quantity rose slowly, but later moved more rapidly. After the 120th circulation, a stationary state was reached in the desulfurization reactor. It was characterized by a constant replenishment quantity and stable properties of the activated coke. The adsorption capacity of the activated coke for SO2 rose with the decreasing bulk weight passed through a maximum, and decreased again with furthur activation. The maximum of SO2 retention occurred during the stationary phase of flue gas desulfurization. The investment costs for large desulfurization plants for 300 mW power plants are estimated to amount to between $20-27/kW electric power. The results obtained and the cost estimates justify further trials of adsorption coke on a larger scale. (Author abstract modified)

32130 **APTIC NO. 55093**

Kaplan, Norman

AN EPA OVERVIEW OF SODIUM-BASED DOUBLE ALKALI PROCESSES. PART II: STATUS OF TECHNOLOGY AND DESCRIPTION OF ATTRACTIVE SCHEMES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Monitoring. (Presented at the Environmental Protection Agency, Flue Gas Desulfurization Symposium, New Orleans, La., May 14-17, 1973.)*

Important considerations for the evaluation of double alkali schemes are discussed, including sulfate removal, scale prevention, water balance, waste product washing, sulfur dioxide removal, and costs. Flow sheets for potentially attractive schemes of operation are presented and the schemes described, with emphasis on the evaluation of each with respect to these criteria. The schemes are: limestone regeneration using dilute active alkali with sulfite softening; lime regeneration using dilute active alkali with sulfite softening; lime or limestone regeneration using concentrated active alkali with sulfuric acid sulfate removal; and lime regeneration using dilute active alkali with carbonate softening. A brief description of selected pilot plant and prototype experiences and future plans for the further development of alkali systems is given. An effort is made to categorize each of the double alkali systems presently being marketed, in accordance with the identified schemes. The EPA/A. D. Little double alkali development program plan and general philosophy are summarized. Double alkali technology, although less advanced, is presented as being potentially more reliable and less costly than lime/limestone technology. (Author abstract modified)

32131 **APTIC NO. 54884**

Kawanaka, A.

WET SYSTEM EXHAUST GAS DESULFURIZATION PLANTS AND IMPROVED GYPSUM RECOVERY SYSTEM PLANTS. *(Shishiki haien datsuryu sochi narabini sekko kaishitsu Sochi). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(10):937-952, Oct. 1973.*

The mechanism characteristics, and performance of the wet system exhaust gas desulfurization plants developed by the Chemical Construction Corp., (Chemico) and the Mitsui Miike Machinery Co. are described. The Chemico magnesium oxide scrubber system recovers MgO, sulfuric acid, and sulfur from the sludge formed by the reaction between sulfur oxide and magnesia. The Chemico lime scrubber system passes flue gas through two series of lime scrubbers. Chemico also makes venturi scrubbers, and other desulfurization and dust removal equipment. The Mitsui gypsum recovery system uses a catalyst to control hydrogen ion concentration (pH) and oxidation. In this system, calcium carbonate may also be used in place of calcium oxide, calcium hydroxide, or carbide sludge. The Mitsui-Chemico desulfurization system consists of the combined Mitsui gypsum recovery system and the Chemico lime scrubber system, in which the Chemico two-stage scrubber is utilized with the catalytic system. A Mitsui improved gypsum recovery system which produces special grade gypsum for plaster is also described.

32132 **APTIC NO. 54869**

Kikuchi, T., T. Abe, and M. Sone

STUDIES OF ODOR CONTROL IN FISH RENDERING PLANTS (I), (ESPECIALLY IN RENDERING PLANTS FOR WHALES AND SHARKS). *(Gyochokotsu shori kojo no bosyu taisaku ni kansuru kenkyu (I), (tokuni kujira same nado shorijo ni tsuite)). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep., no. 1:20-26, May 1973. 3 refs.*

Odor components in the waste gases of fish rendering plants were studied in order to improve odor control. Analyses of gases in whale and shark rendering plants showed that the ammonia content was 10 to 100 times as much as appeared in the waste gases of general fish plants. The trimethyl amine content was also higher. The odor associated with the whale and shark plants was considerably stronger and somewhat different than that of the general fish works. Tests for odor control using chemical reagents showed that both hydrochloric acid and caustic soda solutions were ineffective in odro control, but that hydrogen peroxide solutions, even in a dilute state, were extremely efficient. Waste gases contain low molecular weight odorous components that may be easily oxidized.

32133 **APTIC NO. 54885**

Kim, C. H., M. J. Yun, and S. P. Kuon

COMPARISON OF VARIOUS SYSTEM EXHAUST GAS PURIFIERS FOR GASOLINE ENGINES. *(Gasoline engine yo kakushu haikigasu jokaki no hikaku shiken). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(9):39-45, Sept. 1973. 24 refs.*

Characteristics of auto exhaust gas purification systems were compared to determine efficiency of carbon monoxide removal and fuel consumption. Fuel injection control (FIC) proved the most efficient, showing a 25-44% fuel savings. Secondary air injection (SAI) gave a saving of 20%, and the improved ignition point system gave a 10% saving. With an engine speed of 6000 rpm, the saving was 30% lower than at 1200 rpm. Carbon monoxide removal ratios increased in proportion to fuel saving. Catalytic muffler systems were outstanding with respect to CO removal, but had some problems with initial cost, life of catalyst, fuel consumption, and performance reduction. An average CO removal of 97.8% was established with the FIC, and fuel consumption was 0.11 l/km, a 38.2% fuel saving.

32134 **APTIC NO. 55013**

Kinoshita, K. and S. Yamazaki

DEVELOPMENT OF THE NISSAN MOTOR GAS TURBINE FOR AUTOMOTIVE USE. *Preprint, American Society of Mechanical Engineers, Washington, D. C., Gas Turbine Div., 7p., 1973. (Presented at the American Society of Mechanical Engineers Gas Turbine Conference and Products Show, Washington, D. C., April 8-12, 1973.)*

The fuel control system and variable nozzle control of the Nissan Motor gas turbine for automotive use are described. The fuel control system consists of a computing circuit, a sequence circuit which regulates the procedure from the engine start to the idling speed, and the safety circuits to avoid overspeed and overheat of engine parts. In the power turbine variable nozzle control system, schedules of the gasifier speed and the optimum nozzle angle versus accel pedal displacement are set in the control system by function generators. Two positions are required for the variable nozzle opening for a position of accel pedal to satisfy both fuel economy at steady state running and fast acceleration at transient state running. The control system senses the gasifier speed and distinguishes whether the running state is steady or transient and then moves the nozzle to the prescribed position. The application of the gas turbine in a rear engine diesel bus is described.

32135 **APTIC NO. 54516**

Kipp, E. B., K. A. Shelstad, and G. S. P. Castle

AN ELECTROCHEMICAL FLOW REACTOR FOR OXIDATION OF HYDROCARBON POLLUTANTS. *Can. J. Chem. Eng., 51(4):494-498, Aug. 1973. 6 refs.*

An electrochemical flow reactor was used for oxidation of hydrocarbon pollutants. The reactor has no packing and is an electrostatic precipitator with a suitable catalyst deposited on the inside wall forming the outer electrode. The pollutants, toluene, n-heptane, l-heptene, and l-propanol, all gave the same S-shaped curve for conversion at different temperatures, with the rapidly rising portion of the curve occurring within the same temperature range 225 to 260 C for the three catalysts used in the reactor. The effect of the corona was to increase the conversion at a particular temperature in all cases, provided that the contact time of the reactant gases in the reactor was not too long. The positive corona was a little less effective in increasing the conversion than was the negative corona. In the oxidation of toluene over 0.25% platinum on alumina, the conversion was substantially higher with the positive corona. An important difference between the three catalysis used, cobalt oxide/alumina, Pt/Al2O3, and Hopcalite was in the carbon dioxide selectivity. The Pt/Al2O3 catalyst had the highest CO2 selectivity with the least amount of partially oxidized substances. There are reactions occurring in or induced by other processes taking place within the ionized sheath of the discharge. Formation of ozone and of activated forms of oxygen are known to occur for corona in air and these substances might well initiate oxidation of the organic pollutant.

32136 **APTIC NO. 54785**

Kolp, Robert J.

PROBLEMS OF DUST AND NOISE IN READY MIXED CONCRETE AND AGGREGATE OPERATIONS IN RELATION TO OSHA AND BUREAU OF MINES REGULATIONS. *Preprint, National Sand and Gravel Assoc., Silver Spring, Md., and National Ready Mixed Concrete Assoc., Washington, D. C., 12p., 1973. (Presented at the Joint National Sand and Gravel Association, National Ready Mixed Concrete Association Session, Bal Harbor, Fla., Jan. 16, 1973.)*

Problems of dust and noise in ready mixed concrete and aggregate operations are presented in relation to the Occupational Safety and Health Act and Bureau of Mines regulations. The dust limits set by OSHA for portland cement with more than 5% silica and for inert or nuisance dust, respirable fraction and total are 10, 5, and 15 mg/cu m, respectively. Respirable fraction sizes range from 0.5 to 5 micron, and these are capable of penetrating deep into the air sacs of human lungs. A dust sampler which simulates the lungs selectively of particle size and which can be worn by the worker on his lapel has been developed to draw dust laden air through a cyclone/filter assembly at a preselected flow rate. The cyclone stage of the assembly discards the larger non-respirable size particles, and the smaller particles are trapped by the filter which has been preweighed. The filter is again weighed at the end of the sampling period, and the dust weight per unit volume is determined. Dust compliance measures may include increasing pavement in yards, installation of washdown systems for cleaning the pavement, storage of aggregates in silos and bins, and installation of dust collectors on all cement bin and hopper vents.

32137 **APTIC NO. 54405**

Krishnan, N. Gopala and Robert W. Bartlett

KINETICS OF SULFATION OF REDUCED ALUNITE. *Environ. Sci. Technol., 7(10):923-929, Oct. 1973. 10 refs.*

The United States contains more than 500 million tons of the mineral alunite (K2SO4.3Al2(SO4)3.6H2O), which is a potential regenerable absorbent for removing sulfur dioxide from dilute effluent gas steams. The alunite must be desulfurized to K2O.3Al2O3 prior to sorption in a process step identical with absorbent regeneration. The sulfation kinetics of hydrogen desulfurized alunite were determined between 100 and 500 C in SO2 concentrations from 0.1 to 0.5%. Sulfation below 300 C is limited to the reaction with K2O. Above this temperature, Al2O3 is also sulfated, resulting in the formation of potassium aluminum sulfate, and the rates can be expressed as parallel processes. Each sulfation rate is proportional to the SO2 concentration, and the remaining unreacted oxide, K2O and Al2O3, respectively. The experimental activation energy is low. The sulfation of K2O is independent of oxygen pressure, and the rate-controlling step appears to be the formation of potassium sulfate, which is subsequently oxidized to sulfate. (Author abstract)

32138 **APTIC NO. 54650**

Kunibe, Susumu

THE PRESENT STATE OF ART IN ADSORPTION TECHNIQUES USING ACTIVE CHARCOAL. *(Kasseitan niyoru kyuchaku gijutsu no genjo to mondaiten). Text in Japanese. Petrochem. Eng. (Japan), 5(7):27-38, July 1973. 38 refs.*

Adsorption characteristics of organic solvents and hydrocarbons on active charcoal are summarized as a function of equilibrium pressure, particle size, pH, and temperature. Activated charcoal used for solvent adsorption should possess high adsorption capacity, selectivity, and chemical stability, and small permeable resistance. It should not be affected by moisture. Odor and air pollutant removal can be accomplished by adsorption on activated charcoal. Regeneration of charcoals is by steam activation after removal of low boiling point odors and by calcination after high boiling point odor removal. Active charcoal is also good for sulfur dioxide and ozone removal and as an adsorbent and catalyst support for sulfuric acid conversion of SO2 in fuel gas desulfurization. Activated charcoal can also be used in water purification.

32139 **APTIC NO. 54198**

Kurosawa, Keiji

ON ELIMINATION OF NITROGEN OXIDES - WET METHOD. *(Chisso sankabutsu jogai-shisshikihoo ni tsuite). Text in Japanese. Preprint, Research Group of Environmental Techniques of Japan, Osaka, p. 69-72, 1973. (Presented at the Seminar on Environmental Techniques, Osaka, Japan, May 16-17, 1973.)*

Dry and wet nitrogen oxide removal methods are compared. Wet methods are generally used since they are more economical, more stable, and require less equipment. It is difficult to use the dry method in boilers and furnaces which have already been constructed. A process in which nitric oxide is ozidized by manganese oxide and captured as nitrogen trioxide in water is discussed. This method eliminated 70-99% of the NO during a 10-second contact period in a pilot plant of 300-700 N sq m/hr. The absorbing liquid can be regenerated.

32140 **APTIC NO. 54485**

Lawrence, Peter A.

DESULFURIZATION OF FUEL OIL. *(Entwschefelung von Heizoel). Text in German. Chem. Ing.-Tech., 45(19):1141-1147, 1973. 13 refs.*

The construction of fuel oil desulfurization plants is a consequenc of legislation to reduce sulfur dioxide emission into the atmosphere. The technical and economic aspects of the application of catalytic hydrogenating desulfurization to crude oil distillates and residues using both fixed bed and fluid bed processes are discussed. Special attention is paid to conditions in Japan and the USA, the only countries in which large scale residue desulfurization is so far practiced, and to trends in Western Europe. For fixed catalysis, desalinated and filtered fuel oil is mixed with hydrogen-enriched gas under high pressure and passed downwards through the fixed catalyst bed. Since the reaction is exothermal quenching, gas is injected between the catalyst beds for regulation of the reaction temperature. An alternative to this process is the method where oil and hydrogen pass the reactor in an upward direction with such speed that the catalyst is suspended. This method is isothermal. The consumption of hydrogen is rather high and amounts to between 100 and 200 cu m/t. The method for desulfurization of vacuum distillates is similar to the hydrofining process of middle distillates. The capital costs for this method amount to $2/ton, the hydrogen costs to $.40/ton, the catalyst costs to $.01/ton, and the operating costs to $.62/ton. The capital costs for distillation of residues are $3.60/ton, the hydrogen costs $2.30/ton, the catalyst costs $.92/ton, and the operating costs $.92/ton. The costs for hydrogenating desulfurization rise rapidly with the molecular weight of the crude oil. The desulfurization of residues is considerably more expensive than any kind of distillate desulfurization.

32141 **APTIC NO. 54196**

Machi, Sueo and Keita Kawamura

DISPOSAL OF EXHAUST GAS BY THE APPLICATION OF RADIOACTIVE RAYS. *(Hoshasen shosha ni yoru haigasu shori). Text in Japanese. Genshiryoku Kogyo, 19(10):25-28, Oct. 1973. 4 refs.*

Radioactive radiation was used to remove sulfur dioxide emitted by heavy oil combustion. An aerosol was formed which could be collected by an electrostatic dust collector. At the same time, nitrogen oxides were almost completely removed. The change in the gas composition due to the application of radioactive rays was continuously measured in terms of SO2 and NOx.

32142 **APTIC NO. 54174**

Malbin, M. D., A. F. Soby, and W. W. Haskell

ON-LINE DETECTION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AUTOMOTIVE EXHAUST. I. EVALUATION OF CATALYTIC CONVERTERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 34p., 1973. 22 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-77.)*

A new detector, based on the gas phase fluorescence of polynuclear aromatic hydrocarbons (PNA), is described for the determination of PNA at levels of 1 microgram/cu m (sensitivity for benzo(a)pyrene). The overall concentration reduction of PNA in the exhaust as well as the efficiency of two commercial catalytic converters (a noble metal and a nonnoble metal type) in oxidizing PNA were investigated. These devices were evaluated while operating in the exhaust system of a 318-CID, V-8 engine operated on a dynamometer test stand. The efficiency of the control system was evaluated for a number of conditions of secondary air injection at two steady speeds. Both converters reduced the concentration of PNA in exhaust by greater than 90% at 1500 rpm (equivalent to 35 mph level road load) and nearly this amount at 2500 rpm (58 mph). Neither converter appeared to degrade in hydrocarbon, carbon monoxide, or PNA reduction performance over a period of 5000 mi of operation (accumulated by operation of engine through a test cycle). At the concentrations at which PNA occur in exhaust (typically, micrograms/cu m of exhaust), catalytic oxidation appears to be limited by mass transport of the hydrocarbon to the catalyst surface. Measurements at higher exhaust flow rates show that the residence time and catalyst volume are important parameters in determining the effectiveness of the exhaust emission control system. (Author abstract modified)

32143 **APTIC NO. 54542**

Mangold, Klaus

OPERATING EXPERIENCES IN EXISTING SLUDGE TREATMENT PLANTS. II. PURIFICATION PLANT URBACH PLUEDERHAUSEN, KREIS WAIBLINGEN (THERMAL SLUDGE DRYING, SYSTEM SEILER-KOPPERS). *(Betriebserfahrungen aus Schlammbehandlungsanlagen. II. Klaeranlage Urbach-Pluederhausen, Keis Waiblingen (Thermische Schlammtrocknung, System Seiler-Koppers). Text in German. Ber. Abwassertech. Ver., no. 26:455-460, 1973.*

With the Seiler Koppers sludge drying process the water content is reduced through evaporation. The necessary heat is produced by combustion of oil, natural gas, or methane. In the purification plant, Pluederhausen oil is used. The drying plant comprises the following components: sludge mixer and feeder, hot gas generator and drying drum, and the dried goods storage and sacking facilities. The digested and thickened sludge is mixed with dried material so that a water content of 40 to 60% is obtained. This material goes to the drying drum which is composed of three concentrically arranged cylinders. The air flow and the sludge are twice deflected by 180 deg within the drum. The dried sludge particles are drawn off continuously. The temperatures at the drum entrance measure 300 to 600 C, at the drum exit 70 to 90 C. The drawn off air with the vapors and the dried materials goes to a cyclone which separates the dry material from the waste air and vapors. The dry material goes to a silo from where part of it is returned to the sludge mixer. The rest is filled into plastic bags. Waste air and vapors from the cyclone go to a jet gas scrubber by way of a ventilator. The scrubbing water is taken from the outflow of the post purification basin. The loaded scrubbing water returns to the inflow of the purification plant. The scrubbing water throughput amounts to about 40 cu m/hr. The nominal capacity of the plant of 3 cu m/hr sludge throughput was maintained on the average during an observation period lasting from Feb. 21 to Sept. 7, 1972. The final product has a solids content of 93%. The operating costs during this observation period were calculated to have amounted to $5/cu m.

32144 **APTIC NO. 54419**

Marrara, Robert S.

PISTON ROD AIR CLEANING DEVICE. *(Assignee not given.) U. S. Pat. 3,728,944. 4p., April 24, 1973. 9 refs. (Appl. Jan. 15, 1971, 6 claims).*

A piston rod air cleaning device is described in which the exhaust air of a pneumatic motor is fed to a chamber surrounding a piston rod at the end of the cylinder through which the piston rod reciprocates. The air flows axially of the piston rod away from the cylinder to carry all dirt and foreign material away from the cylinder. In hydraulic actuated cylinders a similar chamber is provided and fed with air from a separate air supply. This device eliminates all contamination of the type normally carried into the cylinder by the piston rod. (Author abstract modified)

32145 **APTIC NO. 54886**

Nagai, Hirokazu

DESULFURIZATION EQUIPMENT FOR EXHAUST GAS. *(Haikigasu no datsuryusochi). Text in Japanese. (Tokyo Shibaura Electric Co., Ltd., Kawasaki (Japan)) Japan. Pat. Sho 48-13102. 2p., April 9, 1973. 1 ref. (Appl. Feb. 25, 1967, 1 claim).*

Desulfurization equipment for exhaust gas is designed to collect sulfur dioxide as sulfuric acid. An air preheater with a simple structure and excellent corrosion resistance is made up of heating plates with a very wide heating area. The heating plates are combined and jointed at the upper and lower ends, with the packings at the bent ends of the plates so that a pathway for cooling air is formed in the horizontal direction of the preheater. A pathway for combustion gas is formed in the vertical direction. The surface of the plate on the gas pathway side is enameled with an acid-proof porcelain and the packings are made of H2SO4-resistant fluoro plastic. The air preheater can be fitted to the fire flue for combustion gas from the boiler of a thermal power plant.

32146 **APTIC NO. 54187**

Negishi, Naoki

AN ACTUAL EXAMPLE OF THE USE OF ACTIVATED CARBON IN A GASEOUS PHASE. *(Kiso ni okeru kasseitan riyo no jitsurei). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, Kanto Branch, p. 18-28, 1973. 9 refs. (Presented at the Japan Society of Chemical Engineering, Study Meeting, 66th, Tokyo, Japan, Sept. 21, 1973.)*

Activated carbon can be used in a fluidized bed (such as in the recovery of ethylene from thermal cracking methane gas) or in a stationary bed (desulfurization of smoke from a thermal power plant). The former was studied in a 200 mm diameter test plant at 1500 cu m/hr. Stable operation was attained up to 9 tons/hr of circulating activated carbon; the ratio of carbon to the amount of thermal cracking gas and the location of the side cut influenced the yield and purity of the product. A 6000 N cu m/hr test plant, a 150,000 N cu m/hr test plant, and a 420,000 N cu m/hr test plant were used for tests of desulfurization.

32147 **APTIC NO. 54318**

Ogiya, Ikuo

DEODORIZING TECHNIQUE DEVELOPED BY DAISHOWA PAPER AND PULP CO., LTD. *(Daishowa Seishi (kabu) ni okeru akushu haisui no dasshu gijutsu no tekiyo). Text in Japanese. Preprint, Kogai Kenkyu Taisaku Center, Tokyo, p. 65-76, 1973. (Presented at the Seminar on Practice and Application of Bad Odor Countermeasure Techniques, Tokyo, Japan, Aug. 1-2, 1973.)*

A reduced pressure steam stripping method to remove hydrogen sulfide, dimethyl sulfide, methyl mercaptan, and methyl sulfide from pulp wastewater is described. The was

32148 **APTIC NO. 55044**

Oglesby, Sabert, Jr.

DESIGN CONSIDERATIONS FOR ELECTROSTATIC PRECIPITATORS. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 37-52. 2 refs. (March 29-30.)*

Design considerations for electrostatic precipitators are discussed. Precipitators for removal of solid or liquid aerosols from industrial gases vary in a number of respects. Their physical arrangements vary according to whether they are to be operated wet or dry, the types of electrodes, and the methods of rapping. One of the most significant problems in design of precipitators is determining the size required to achieve a given level of efficiency. Precipitator efficiency is dependent on the charge on the dust and the electric field in which it is collected. These are influenced by the electrical resistivity and size of the dust being collected. Sizing of the precipitator involves determination of the required collection surface area, as well as the overall shape and size of the units, which are often governed by the space available, particularly in retrofit installations. Although there are many variations in the details of calculating the size of a precipitator, the methods are generally based on the relationship between gas volume, collecting surface area, and collecting efficiency, as described by the Deutsch-Anderson equation. A second design method involves using tests in a pilot scale precipitator to arrive at the design conditions. The concept behind this method is that the pilot scale precipitator will respond in the same manner as a full scale precipitator to changes in particle size and resistivity of the dust, gas composition, and other factors, and thus indicate with some precision the required size of the full scale unit. A third method of sizing a precipitator involves the use of a theoretical analysis to extrapolate known conditions to those corresponding to the new requirements. (Author abstract modified)

32149 **APTIC NO. 54611**

Opitz, Wolfgang

OPERATING EXPERIENCES WITH EXISTING SLUDGE TREATMENT PLANTS. III. PURIFICATION PLANT KORNWESTHEIM (THERMAL CONDITIONING, CHAMBER FILTER PRESS). *(Betriebserfahrungen aus Schlammbehandlungsanlagen. III. Klaeranlage Kornwestheim (thermische Konditionierung, Kammerfilterpresse)). Text in German. Ber. Abwassertech. Ver., no. 26:461-464, 1973.*

The sludges from the purification plant in Kornwestheim are first thermally conditioned by the Porteous process. In a heat exchanger the sludge is preliminarily heated to 160 C by passing countercurrently the already dried sludge. This preheated sludge is fed to the reactor after steam of 190 C and 17 atm has been added. The boiling time is 40 min. Afterwards the sludge flows again through the heat exchanger and then goes to a thickening basin. The gas forming at the boiling process is continuously drawn off, cooled, and burned in the steam boiler for deodorization. After 12 to 15 hr in the settling basin, the water on top of the sludge is removed. The sludge with a solids content of 20% goes to the filter press. It has a volume of 1.80 cu m and dewaters the sludge to a residual water content of 45%. The process time per charge is 2.5 to 3 hr. The filtrate has a B.O.D. of 5000 to 6000 mg/l. The operating costs amount to about $1.40/cu m sludge. The dried sludge is to a large extent (70%) dumped on public dumping grounds.

32150 **APTIC NO. 54758**

Petersen, Klaus and Helmut Kahnwald

DIRECT COLLECTION OF THE DUST-CONTAINING FUMES OF ELECTRIC-ARC FURNACES DURING THE PRODUCTION OF HIGH-CHROMIUM STEELS AND THEIR DE-DUSTING WITH THE AID OF CLOTH FILTERS. *(Direkterfassung der staubhaltigen Abgase von Elektro-Lichtbogenoefen bei der Erzeugung hochchromlegierter Staehle sowie deren Entstaubung mit Gewebefilter). Text in German. Stahl Eisen (Duesseldorf), 93(20):910-914, Sept. 27, 1973. 1 ref.*

A cloth filter was installed after a 10-ton and 20-ton electric arc furnace for the purpose of testing the operation of the filter during production of stainless, acid and heat-resistant steel. A further study was to investigate the dust, heat, and gas quantity produced during decarburization with oxygen. A stone cooler preceded the polyester filter. The filter consisted of 12 chambers containing ten bags each with a total effective filter area of 660 sq m. The modifications which were necessary to improve the performance of the filter are described. Reliable relationships between entry carbon content, and mean as well as maximum decarburization rates during refining low-alloy and high-chromium heats can be derived. With regard to the measured amount of dust, a linear relationship with the decarburization rate can be determined. A collection efficiency of the filter of 99.75% was determined. The average dust emission was 0.02 kg/tons of crude steel/min. The gas quantity drawn into the filter was determined in dependence of the average decarburization rate. The results yielded an amount of 1000 cu m/t/hr.

32151 **APTIC NO. 54954**

Rehmus, F. H., D. P. Manka, and E. A. Upton

CONTROL OF H2S EMISSIONS DURING SLAG QUENCHING. *J. Air Pollution Control Assoc., 23(10):864-869, Oct. 1973. 8 refs.*

The control of hydrogen sulfide emissions during slag quenching was investigated. An analysis of slag pit variables was made and correlations obtained between pit dimensions, time interval between pours, and the slag temperature when the pit is filled and ready for quenching. Field trials demonstrated the effect of temperature on the level of emissions and how the level varies during the quench period. Quantitative information was obtained to show the effects of slag filling rates, air cooling prior to quenching, and the influence of oxidizing agents added to the quench water. A 45% reduction in emission level after 3 days cooling and a 88% reduction in emission level after 3 days cooling plus 100 ppm potassium permanganate can be obtained. The following reduction in the level of H2S emission is possible. Emissions can be reduced 70% by a 12 day filling schedule. A 3 day (minimum) cooling period before quench will reduce emissions by 55%. A 75% reduction can be obtained by using 100 ppm of KMnO4 in the quench water. A combination of these practices can reduce the level of H2S emissions by 96% in slag pits. (Author abstract modified)

32152 **APTIC NO. 55180**

Rhodes, D. W.

CHEMICAL DEVELOPMENT WORK IN SUPPORT OF FLUIDIZED-BED CALCINATION OF RADIOACTIVE WASTES AT THE IDAHO CHEMICAL PROCESSING PLANT. *Allied Chemical Corp., Idaho Falls, Idaho, National Reactor Testing Station, Atomic Energy Commission Contract AT (10-1)-1375 S-72-1, 23p., Aug. 1973. 23 refs.*

NTIS: ICP-1025

Chemical development work in support of fluidized bed calcination of radioactive wastes at the Idaho chemical processing plant is reported. Aqueous radioactive wastes are routinely converted to granular solids by calcining in a fluidized bed calciner at 400-500 C. Wastes calcined to date include acid aluminum nitrate, acid zirconium fluoride, acid deficient ammonium nitrate, and acid stainless steel sulfate. Significant chemistry development work was performed to make possible the calcination of these wastes. The formation of alpha instead of amorphous alumina is possible by the addition of boric acid to the feed solution. Volatilization of fluoride, sulfate, and ruthenium was prevented by adding calcium nitrate to the waste prior to calcination. Complete decomposition of ammonium nitrate was obtained by blending it with acid aluminum nitrate waste. Potential volatilization of mercury was removed in the wet scrubbing system. Acid sulfate waste was blended with aluminum nitrate solution to form aluminum sulfate which is stable during calcination. If the sulfate volatilized, it could concentrate in the scrubbing solution and corrode the stainless steel equipment. Other problems associated with the calcination process that currently are being studied include agglomeration in the bed during calcination of sodium nitrate containing wastes, and possible volatility and concentration of chloride in the scrubbing solution during calcination of wastes containing low concentration (greater than 2 g/l) of chloride. (Author abstract modified)

32153 **APTIC NO. 54486**

Rudolph, M.

PRIMARY POWER CONSUMPTION AND POLLUTANT EMISSION IN URBAN TRAFFIC A MODEL COMPARISON BETWEEN CONVENTIONAL AND ELECTRIC TRACTION. *(Primaerenergieaufwand und Schadstoffemission im Stadtverkehr-Modellvergleich zwischen konventioneller und elektrischer Traktion). Text in German. Brennstoff-Waerme- Kraft, 25(9):366-370, Sept. 1973.*

The environmental pollution to be expected by 1980 by conventional and electric types of transportation transporting one ton of useful load over a 1 km path is compared. The thermal pollution expressed by the total primary energy consumption and the emission quantities for the most important pollutants are compared. Environmental pollution by energy conversion and the pollution by final consumption in the automobile are described. The total primary energy demand for electric traction with 1384 Wh is about 20% better than for an automobile with a spark ignition engine. A comparison of the total pollutant emission yields much more favorable values for electric traction as far as the emission of particulates, carbon monoxide, hydrocarbons, and oxides of nitrogen is concerned. The sulfur dioxide emission is higher for the electric automobile by half the SO2 emission of the spark-ignition engine, while electric cars are entirely free of lead emissions. With electric traction all pollutants are emitted on the primary conversion stage.

32154 **APTIC NO. 54339**

Sakai, Yasuo, Hiroaki Miyazaki, and Kosuburo Mukai

EFFECT OF COMBUSTION CHAMBER SHAPE ON FORMATION AND EMISSION OF NITROGEN OXIDES. *(Nenshoshitsu keijo ga NO ni oyobosu eikyo). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), no. 5:16-24, June 1973. 6 refs.*

Previous studies have indicated that the peak combustion temperature and the point at which it occurs in the engine cycle have a major influence on the formation of nitric oxide. The relationship between the heat release rate and the formation and emission of NO was investigated both analytically and experimentally. To determine the effect of the combustion pattern on NO formation, the shape of the combustion chamber and the location of the ignition plug were modified in a single cylinder 4-cycle gasoline engine. In addition to NO formation, the engine tolerance for lean mixture operation and exhaust recirculation were examined.

32155 **APTIC NO. 54890**

Sakuma, Shuichi

CLEANING EQUIPMENT FOR SMOKE. *(Baien seijo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-13473. 4p., April 12, 1973. 3 refs. (Appl. Feb. 15, 1969, 1 claim).*

Soot, dust, and harmful gas is removed from the smoke discharged from industrial and domestic heating combustion. A pair of smokepaths is provided so that the inlet opening and the outlet opening are connected. The adjoining ends of a pair of smokepaths on the inlet and outlet sides are provided with doors so that the smokepaths are also connected. The first and second cleaning parts, and the forced discharging part are built up in the direction of the outlet opening from the inlet opening, using acid-proof ventilation walls in the middle of each smokepath. Pipes with a large number of jet water openings are provided within the first cleaning part, and the second cleaning part is given cylindrical porcelain adsorbents. The forced discharging part is provided with a motor-driven suction fan so that the stream of exhaust gas is forcibly formed in the direction of the outlet from the inlet.

32156 **APTIC NO. 54757**

Scheers, A. H.

SAFETY SYSTEMS AND AIR POLLUTION. 8. 4: FLARE DESIGN. *(Veiligheidssystemen en luchtverontreiniging 8. 4. Fakkelinstallatie). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 28(13):416-424, June 1973.*

General problems of the design of pilot burners, igniters, burners, flare tips, and flare stacks are described. Pilot burners are used to ignite the gases to be released, and to keep them burning. Pilot burners are ignited by means of electric or conventional ignition systems. Pilot flames should stable under all possible weather conditions, and should consume as little gas as possible. Pilot burners should be completed with alarm systems, e.g., thermocouples with temperature recorders, for the signalization of breakdowns. Smokeless combustion of the waste gases is possible by providing a high temperature for the water-gas reaction to occur good mixing of the combustion air with the waste gas, and good flare tip design facilitating intense turbulence of the air-steam-waste gas mixture.

32157 **APTIC NO. 55047**

Schiller, M.

ELECTROSTATIC PRECIPITATORS: HOW WELL DO YOU PROTECT YOUR INVESTMENT. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 71-77. 10 refs. (March 29-30.)*

Methods of identifying real and potential precipitator problems are presented, and recommendations are made to general management principles and specific technical procedures which could be of use in eliminating or minimizing current maintenance shortcomings. Responsible administrators must establish the necessary mechanics that would automatically keep them informed of emission standards and their own status with regard to compliance. Appropriate personnel must be selected for the specific job of operating and maintaining precipitator equipment. The Precipitator Man should be someone with engineering training or equivalent experience and be thoroughly educated in precipitator systems. The administrators must establish clear cut guidelines with regard to expected performance. Comprehensive record keeping as a feedback vehicle cannot be overemphasized. Basic instrumentation to provide good analytical data include: precipitator temperature, multiposition thermocouple switches with readouts; power supply primary voltage and current; precipitator voltage and current; spark rate, rapper voltage and current or rapper pressure; pressures in critical areas of precipitator; humidity; and velocity and flow in critical areas. Flexibility is the key to problem solving. Changing conditions within the precipitator dictate a need to adjust solutions to the prevailing situations rather than be locked into rigid procedures. Costs are cited.

32158 **APTIC NO. 54850**

Schirmer, Wolfgang and Heinz Harenz

ASPECTS OF REDUCING THE ENERGY DEMAND FOR THE TREATMENT OF MINERAL OIL AND FOR PETROCHEMICAL REACTIONS. *(Aspekte der Verminderung des Energieaufwandes bei der Verarbeitung von Erdoel und bei der Durchfuehrung petrolchemischer Reaktionen). Text in German. Chem. Tech. (Berlin), 25(8):453-458, Aug. 1973. 25 refs. (Presented at the Fachtagung der Wissenschaftlichen Sektion Ver arbeiten von Erdoel und Erdgas des FV Chemische Technik der KDT, Frankfurt, West Germany, May 24-25, 1973.)*

Any process energy which is used goes as waste heat into the atmosphere or into water bodies. Waste heat utilization or better use of the energy thus is not only important for the growing energy shortage but also for environmental protection. Energy-saving processes for mineral oil treatment, olefin production and separation, and the selective separation of substances are outlined. For many heat transfer problems the use of a heat pump has proved very valuable, for instance at the separation of a gas mixture from propane and propylene. Modern mineral oil treatment is characterized by a high energy demand for the operation of pumps and compressors. For avoidance of this, mineral oil refineries are nowadays combined with back pressure turbines. An outstanding example for the systematic improvement of energetic efficiency is the synthesis of ammonia. Particularly since natural gas is used as a hydrogen source for the production of synthesis gas, the use of waste heat could be improved so that the reaction enthalpy of the ammonia synthesis is utilized to about 90%.

32159 **APTIC NO. 55300**

Schneider, G.

EXPLOSION PREVENTION MEASURES AT DUST EXTRACTION UNITS. *(Explosionsschutzmassnahmen an Entstaubungsanlagen). Text in German. Zucker, 26(10):524-532, 1973. 12 refs.*

In several cases of dust explosions in sugar factories in the last few years the explosion was conveyed to distant sections in the factory by a central dust exhaustion system. Therefore explosion tests were carried out in an abandoned sugar factory. Three dust exhaustion pipes lead to a five-chamber tubular bag filter with a volume of 20 cu m. In dust exhaustion systems of conventional design a spread of the explosion over the entire connected system is possible. The explosion is spread particularly through pipes with small diameters. The pressure strength of a pipe with a wall thickness of 1 mm is insufficient. In filters with tubular bags hanging freely in the casing, the fasteners and the support rings are conductors. The energy of the discharge spark is so high that an ignition of an explosive sugar and dust atmosphere cannot be ruled out. The dust exhaust pipes leading from separated sections of the plant to the filter must be conducted individually all the way to the filter. They enter the filter over explosion relief pipes. The formula for calculation of the necessary explosion relief area at maximum allowable explosion pressure is explained. The fasteners for filters and the support rings must be electrostatically grounded.

32160 **APTIC NO. 55046**

Schoeck, Vincent E.

FILTER FABRIC--THE HEART OF THE SYSTEM. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 103-117. (March 29-30.)*

The development, application, and problems of filter fabrics are described. The growth in the use of fabric filters, and the evolution of various equipment types (cleaning methods) can be tied directly to the development of new fibers and their conversion to various fabrics, woven and felted, suitable for use in fabric filters. Prior to 1946 there were two basic fibers used in dust collectors. Both fibers were natural fibers, cotton and wool, both had low recommended operating temperatures. Polyamides were introduced prior to the war, but began to have filter fabric significance with their availability after World War II. In 1955 polyester fibers became commercially available. This fiber type is today the most widely used of all synthetic types available. In 1964 Teflon and Nomex came into existence and initial filtration usage began. Tables are presented to rate the various fibers relative to each other based on heat, abrasion, and chemistry. Temperature capability ranges from 180 F for polypropylene to 525 F for fiberglass. The real problem most often experienced is acid attack. Nomex is attacked by sulfur trioxide in a high oxygen content atmosphere even when moisture is low. Sulfuric acid is detrimental to most of the high temperature fibers, as polyester and Nomex, but not to fiberglass. Hydrofluoric acid is detrimental to polyester, Nomex, and glass. Periodic precoating with lime will absorb sulfur dioxide and SO3 providing some protection to the filter fabric. Proper construction and selection of the filter fabric assures quality performance. The type and size of the pollutant determines the type of fabric. The wrong fabric can severely reduce effectiveness.

32161 **APTIC NO. 55298**

Schultess, W.

DUST EXTRACTION FOR STONE, HARD ROCKS AND ORE PROCESSING INSTALLATIONS. *(Entstaubung von Anlagen der Steine-, Erden- und Erzaufbereitung). Text in German. Aufbereitungs-technik, 14(9):576-580, 1973.*

German emission protection law will very likely still be passed this year. Among other things it will reduce the maximum allowable dust emission from 150 mg/cu m to 75 mg/cu m. For the stone, hard rocks, and ore processing industries dust collectors are indispensable. They comprise the dust exhaust system and the pneumatic dust transport, the dust collectors and the blowers for producing the necessary underpressure for an adequate gas flow. A discussion of all three parts of a dust collection system is given with due regard for the special conditions in the stone, rock, and ore processing industries. In this industrial sector cloth filters are preferred over all other dust collectors. Cyclones and all other types of centrifugal separators will be used in the future only for preliminary dust collection. The fraction of particles smaller than 1 micron is negligible in these industries. As a material for filters, polyester felts are used exclusively. Tubular bags are most common because they are sturdy and have a long lifetime. As a maximum load, 3 cu m/sq m min is acceptable for the new fabrics. The tendency towards higher loading of the filters reduces the investment costs, but the operating costs grow because of an unproportionally high increase of the filter resistance.

32162 **APTIC NO. 54526**

Shaw, Gilbert

METHOD AND APPARATUS FOR REDUCING ATMOSPHERIC POLLUTION (Gilbert Shaw, Ltd., Campbeltown (Scotland)) U. S. Pat. 3,732,695. 8p., May 15, 1973. 5 refs. (Appl. Dec. 30, 1971, 10 claims).

A process and apparatus for purifying the exhaust gases from an internal combustion engine are described. Water in exhaust gases from vehicular internal combustion engines is a primary air pollutant when it condenses to form a water droplet or ice particle aerosols as it rises in the atmosphere. The frequency of airborne water of combustion droplets or ice particles is reduced by reducing the amount of water available for water droplet or ice particle formation. The vehicle exhaust gases are cooled to a temperature in the range between the dew point temperature of the contained water of combustion and the ambient temperature of the air surrounding the vehicle. The surrounding air is the coolant for a heat exchanger in which a substantial percentage of the contained water of combustion is condensed. Condensation nuclei normally present in vehicle exhaust gases are entrapped in the condensed water of combustion as a result of the washing action of same. The condensed water of combustion and condensation nuclei mixture are separated from the residual noncondensed exhaust gas. The water of combustion and the entrapped condensation nuclei are stored in a receptacle for subsequent removal. The residual exhaust gas from which a substantial percentage of the initial water of combustion has been removed is reheated and a positive reduction of the initial condensation nuclei content has been made to prevent formation of an undesirable cooled exhaust gas blanket at road level. (Author abstract modified)

32163 **APTIC NO. 55067**

Shaw, H.

REDUCTION OF NITROGEN OXIDE EMISSIONS FROM A GAS TURBINE BY FUEL MODIFICATIONS. *Preprint, American Society of Mechanical Engineers, 8p., 1973. 21 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Washington, D. C., April 8-12, 1973, Paper 73-GT-5.)*

A broad experimental program was undertaken to assess the feasibility of reducing oxides of nitrogen from aircraft gas turbine engines by fuel modifications (additives and/or treatments). The modifications were selected without regard to practical limitations. The Esso high pressure cannular combustor was used to simulate the characteristic emissions of gas turbines. Approximately 70 fuel modifications were tested using Jet A as the basic fuel. These modifications fell into seven general categories: soluble organometallic additives which become heterogeneous reduction or decomposition catalysts; additives that scavenge or recombine oxygen atoms; additives that reduce peak temperatures; additives that delay ignition; additives that change spray fluid-dynamics; additives that decompose nitric oxide or inhibit the NO producing chain reactions; and combinations of the above for synergistic effects. Only the first category proved to be effective in reducing NOx emissions. Transition metals added to the Jet A fuel as organometallic compounds reduced NOx by as much as 30%. Other additives, some not containing metals, reduced NOx by up to 15%. None of the investigated additives was fully acceptable because of the relatively low NOx reduction that was obtained even with high additive rates. The experimental work was carried out at an air to fuel ratio of around 50 and at a pressure of 48 psig. The exhaust gas composition was typical of the latest aircraft turbine engines with the exception that the carbon monoxide levels were too high. A statistical analysis of the results with unmodified Jet A fuel indicated that variation of the air inlet moisture from 0.00025 to 0.0025 lb of watet per lb of air, and pressure variations between 45 and 60 psig had an insignificant effect on NOx production over the range of the experimental work. (Author abstract)

32164 **APTIC NO. 54907**

Smissen, Carl Ernst van der

POSSIBILITIES AND LIMITS FOR THE USE OF AIR FILTERS FOR ENVIRONMENTAL PROTECTION. *(Moeglichkeiten und Grenzen des Einsatzes von Luftfiltern im Umweltschutz). Text in German. Draeger-Heft, no. 292/293:21-25, 1973.*

Air filters include gas filters with activated coal filling and aerosol filters made of paper and fiber. There is no such thing as a universal filter. Every filter must rather be designed for the special case of application. Air filters could be installed into automobiles to protect the driver and passengers against the exhausts in sluggish city traffic. The installation of such filters into existing cars is hardly feasible. For the protection of pedestrians in busy traffic streets gas masks are available. In high-rise buildings along busy streets the rooms are mostly ventilated by a central ventilation system. If it is possible to install the air inlet high above ground level, the installation of only coarse dust filters suffices. Through recirculation of the air, odors and bacteria begin to concentrate, and filters for gaseous substances and for aerosols must be installed. Air filters can also be installed in large kitchens for the removal of odors. However, kitchen vapors contain large amounts of water vapor which reduce the efficiency of gas filters. The air used in hospitals passes through dust filters. In addition, germ filters are installed. Air filters are also used successfully in nuclear power plants, as well as in the bitumen industry. Small domestic oil heaters can hardly be equipped with filters. This shows that the problem of preserving a clean air can only partly be solved by air filters. If adequately applied, their are an important weapon in the battle against air pollution.

32165 **APTIC NO. 54420**

Stafford, Ronald G., Harry J. Ettinger, and Thomas J. Rowland

RESPIRATOR CARTRIDGE FILTER EFFICIENCY UNDER CYCLIC- AND STEADY-FLOW CONDITIONS. *Am. Ind. Hyg. Assoc. J., 34(5):182-192, May 1973. 16 refs.*

Aerosol penetration was tested as a function of particle size using two respirator filter cartridges and one air sampling medium during both steady flow and cyclic flow that simulated differing human breathing efforts. Steady flow conditions were identical to those recommended by the U. S. Bureau of Mines for permissibility tests of respiratory protective devices. Solid monodisperse polystyrene latex aerosols ranging from 0.176 to 2.02 micron in size and liquid monodisperse 0.3 micron dioctyl phthalate were used as the test aerosols. Sampling during cyclic flow was performed without altering the flow pattern through the respirator cartridge. Steady and cyclic flow experimental data were compared as a function of aerosol size, breathing pattern, and aerosol type. Theoretical steady flow aerosol penetration was compared to experimental cyclic flow data. Generally values for maximum penetration during cyclic flow are considerably higher than corresponding steady flow values. Penetration of respirator cartridges and air sampling filters by aerosols larger than 1.0 micron increased at some work rates. It is recommended that test procedures for assessing acceptance criteria as well as personnel protection be reevaluated. Because all filters are different, a specific set of test procedures should be prescribed for each type of filter. (Author abstract modified)

32166 **APTIC NO. 54181**

Sueyama, R.

EFFECTIVE UTILIZATION OF ALKALI SOLUTION IN WET PROCESS DESULFURIZATION FOR WASTE GASES. *(Shissiki haien datsuryu ni okeru alkali yoeki no yuko riyo ni tsuite). Text in Japanese. Netsu Kanri to Kogai (Heat Management Pollution Control), 25(9):77-80, Sept. 1973.*

The optimum operating conditions for absorption of sulfur dioxide by an alkali solution was studied with a stack gas from a heavy boiler containing 1.4 ppm SO2, 15% carbon dioxide, and 3% oxygen. The SO2 was absorbed in a scrubber containing sodium hydroxide. The pH of the absorbent and the SO2 concentration in the inlet and outlet of the scrubber were measured. The pH should be kept at 8.4-5.6 in consideration of corrosion problems and efficiency and loss of NaOH.

32167 **APTIC NO. 54211**

Suzuki, Masayuki and Hideki Yoshigi

ODOR MASKING IN THE KRAFT PULP MILL. *(Kurafuto parupu koho ni okeru ouda masukingu). Text in Japanese. Kami-Pa Gikyoshi (J. Japan. Tech. Assoc. Pulp Paper Ind.), 27(10):504-512, Oct. 1973. 3 refs.*

The possibility of using masking to solve odor problems was studied at a kraft pulp mill. Gas chromatography was used to measure the methyl mercaptan odor; cinnamic aldehyde, citronellol, heliotropin, vaniln, and pulmask in an 0.1% alcoholic solution were used as the masking agents. A perfume substance with an -C double bond C-C double bond O radical masked methyl mercaptan and pulmask masked methyl mercaptan and hydrogen sulfide. Costs are discussed.

32168 **APTIC NO. 54592**

Szabo, Zoltan

ENGINEERING DESIGN PROBLEMS IN THE AIR POLLUTION CONTROL AREA. *(A levegoszennyezes muszaki tervezesi kerdesei). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):191-196, 1973. 22 refs.*

The basic design factors to be considered in planning and design of air pollution control systems especially in the chemical industry are outlined. Quantitative and qualitative data of the expected pollutants, the mode of the emission, the number of the emission sources and features of their operation are needed for any air pollution control system design. Proper siting of the pollution-generating industrial plant with respect to the prevailing meteorological conditions, and adequate choice of technological equipment and technological processes are also necessary to keep the pollutant concentrations below the maximum allowable values. Proper choice of air pollution control devices for the specific type of pollutant to be retained is essential. Low-concentration particulate matter below 10 micron can be removed from gases by electrostatic dust precipitators, scrubbers, bag filters, or packed columns. Droplets larger than 10 micron and dusts in concentrations over 2.5 g/cu m can be removed by mechanical separators, large-mesh filter tissues, or packed columns. Smokes and fumes can be separated by means of high-speed wet-type separators, electrostatic precipitators, or bag filters. The retention of 1 to 10 micron dusts is possible equally by wet and mechanical separators. Settling chambers or cyclones are best for the retention of dust particles larger than 10 micron. Condensation, direct cooling, or compression are available for the retention of high-concentration vapors with dew points over 30 C. Water scrubbing is best for the removal from gases of water-soluble pollutants in concentrations over 1% by volume. Adsorption techniques are applicable to organic vapors with molecular weights in excess of 45. Combustible vapors should be incinerated either thermally or catalytically.

32169 **APTIC NO. 54331**

Takahashi, Junichiro

DEODORIZING TECHNIQUES USED IN DAINIPPON INK AND CHEMICALS INC. *(Dainippon Inki Kagaku Gokyo (kabu) ni okeru dasshu gijutsu). Text in Japanese. Preprint, Kogai Kenkyu Taisaku Center, Tokyo, p. 1-10, 1973. (Presented at the Seminar on Practice and Application of Bad Odor Countermeasure Techniques, Tokyo, Japan, Aug. 1-2, 1973.)*

A combustion method has been experimentally used for removal of bad smelling compounds like fatty acids, alcohols, and aldehydes of low molecular weight exhausted during the production of printing inks from pigments and varnish. Sixty cu m/hr of exhausted gas containing 1/2 1/3 part of combustible gases liberated from the thinning batch is combusted at 700 800 C with 9-10 cu m of town gas in an automatically remote-controlled furnace designed according to a safety regulation. The installation cost was about $16,000 and fuel cost is 200-240 dollars/mo.

32170 **APTIC NO. 55269**

Taylor, K. C. and R. L. Klimisch

THE CATALYTIC REDUCTION OF NITRIC OXIDE OVER SUPPORTED RUTHENIUM CATALYSTS. *J. Catalysis, 30(3):478-484, 1973. 8 refs.*

The activity of supported ruthenium catalysts for reducing nitric oxide to nitrogen in an exhaust-like feedstream was examined in laboratory experiments. The rate and temperature of NO removal is largely dependent on the NO inlet concentration and independent of the concentration of reducing agents in the system. The selectivity for N2 formation is dependent on the concentration of the reducing agents carbon monoxide and hydrogen as well as the concentration of NO. Increasing the NO concentration tends to decrease both the rate of NO removal and the extent of ammonia formation. Increasing CO and H2 concentrations do not affect the rate of NO removal but both tend to increase NH3 formation. The CO tends to affect NH3 formation at low temperature (below 425 C), while H2 tends to increase NH3 formation above 425 C. The primary difference between the noble metal catalysts is that CO strongly inhibits NO reduction over platinum and palladium, but not over Ru. These results are consistent with chemisorption studies and provide an explanation for the efficient conversion of NO to elemental N over Ru catalysts. (Author summary modified)

32171 **APTIC NO. 54186**

Terada, Hiroshi

REMOVAL OF AIR POLLUTION BY ACTIVATED CARBON. *(Kasseitan ni yoru taiki osen no bojo). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(9):651-670, Sept. 1973. 26 refs.*

Activated carbon can be used to adsorb various gases such as sulfur dioxide, nitrogen oxides, ozone, and chlorine. It can remove SO2 from power stations by converting the SO2 to sulfuric acid by catalytic reaction with oxygen and water vapor in its surface. Activated carbon can also remove radioactive radiation, odors, solvents, and evaporated gasoline in a car.

32172 **APTIC NO. 54652**

Terada, Hiroshi

REGENERATION OF ACTIVE CHARCOAL BY CALCINATION. *(Kitai sareru kasseitan no shosei saiseiho). Text in Japanese. Petrochem. Eng. (Japan), 5(7):39-50, July 1973. 19 refs.*

The regeneration of activated charcoal by calcination is described. Chromium, zinc, and lead can be emitted into the atmosphere during regeneration above 600 C. Regeneration by transport-type systems and fluidized bed systems are briefly described. Industrially feasible calcination regeneration is discussed which consists of adsorption, transport, dehydration components, and regeneration furnace. The economics of regeneration, regeneration loss, and regeneration costs are discussed.

32173 **APTIC NO. 54423**

Tomb, T. F., J. F. Martonik, and C. D. Taylor

EVALUATION OF A MACHINE MOUNTED DUST COLLECTOR. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Technical Support Center, Pittsburgh, Pa., Rept. Investigations, 7788, 18p., 1973. 2 refs.*

Field and laboratory investigations were conducted to evaulate a dust collection system designed for integral use with the Jeffrey 120-H Heliminer. Respirable and total dust concentrations were obtained with and without the scrubber in operation. Two shifts a day were sampled, the first shift with the system in operation, and the second with it off. The average respirable dust concentration measured at the machine operator s position was reduced by about 60% (from 8.7 to 3.5 mg/cu m), and total and respirable dust concentrations in the return air by approximately 70%. Approximately 20% of the dust generated at the face was not passed through the scrubber. Collection efficiency decreased as particle size decreased below 4 micron. The overall efficiency (by particle count) was approximately 80% for an aerosol with a particle size distribution and total dust concentrations typical of those encountered during underground continuous mining operations. The respirable mass concentrations of the effluent from the scrubber will still exceed acceptable levels even if scrubbing of all the air at the face is possible. (Author summary modified)

32174 **APTIC NO. 55285**

Tsuji, Shoichi

A LOW NITROGEN OXIDES BURNER. *(Tei sankachisso baana ni tsuite). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(5):640-645, Nov. 1973.*

Nitrogen oxides control was studied experimentally using the pressure atomizing split combustion method, steam atomizing split combustion, circulating volute area mixing combustion, round plane flame combustion, and fan-shaped plane flame combustion. Dust tended to increase as NOx decreased. The first two methods kept dust and NOx concentrations low. The stepwise steam atomizing long flame combustion method increased dust and had less reduction of NOx than the first two methods. The circulating volute area mixing method reduced NOx, but dust increased.

32175 **APTIC NO. 54589**

Tunn, Walter

MERCURY TRACES IN NATURAL GAS OF GERMAN GAS FIELDS AND THEIR INFLUENCE ON THE ATMOSPHERE. *(Quecksilberspuren in Erdgasen aus deutschen Erdgasfeldern und ihr Einfluss auf die Luft). Text in German. Erdoel Kohle (Hamburg), 26(9):498-500, Sept. 1973. 7 refs.*

Natural gas from gas fields in northern Germany contains 450 micrograms/cu m of mercury; gas from sources directly north of Lake Constance contains less than 1 microgram/cu m of mercury; gas reaching the consumer bears 1-3 micrograms/cu m of mercury. Additional amounts of mercury get into the atmosphere as a result of combustion, however, these values are low compared to the initial mercury content in the air. The mercury concentration at combustion sources is far below permitted maximum allowable concentration standards. The mercury background concentration of the atmosphere in West Germany is about 0.01 micrograms/cu m or 0.008 micrograms/kg air. The combustion gas was measured to contain on the average 0.1 micrograms mercury/cu m.

32176 **APTIC NO. 54380**

Vincent, James Henry

ELECTROSTATIC PRECIPITATOR. *(American Standard Inc., New York) U. S. Pat. 3,740,927. 7p., June 26, 1973. 9 refs. (Appl. Nov. 2, 1971, 6 claims).*

A two-stage electrostatic precipitator has been designed to improve the operational characteristics of a conventional electrostatic precipitator (the first stage) by including several charged grids (the second stage) to provide more opportunities for the deflection and removal of gas or airborne particles. The second stage arrangement, when added to a conventional first stage such as the Cottrell structure will improve overall efficiency and allow for a reduction in the length of the first stage. The second section includes several metallic grids which are parallel to each other but perpendicular to the plates of the first section. The total area of openings of each grid is about 60-70% of the effective area of the grid. The first and last grids of the second section may be connected to a source of voltage which does not create a corona field, while the remaining grids of the second section are floated so as to become charged by induced voltage. Hence, particles entering the second section and traversing the opening of the various grids will respond to both the electric field between adjacent grids and to the aerodynamic flow pattern developed between all of the grids. (Author abstract modified)

32177 **APTIC NO. 54407**

Vinson, C. B. and R. I. Kermode

A MATHEMATICAL MODEL FOR SIMULATION OF THE DYNAMIC BEHAVIOR OF THE TYCO PROCESS FOR SO2 AND NOX REMOVAL. *Atmos. Environ., 7(7):723-735, July 1973. 11 refs.*

A mathematical model for simulation of the dynamic behavior of the Tyco process for sulfur dioxide and nitrogen oxides removal from stack gases was developed. In the United States fossil fuel plants emit approximately 20 million tons of SO2 each year, as well as large amounts of nitric oxide and nitrogen dioxide. The steady state operation of the reactor itself was studied in a Tyco in a laboratory pilot unit. The available experimental data plus what is known about the lead chamber process was utilized to formulate a dynamic model of the reactor. The performance of the mathematical model plus controllers were then studied using the IBM System/360 Model 50 computer. The dynamic simulation of the Tyco reactor was very efficient in gaseous pollutant removal. In particular in excess of 90% of the SO2 in the stack gas and almost 100% of the NO and NO2 were removed when the process was subjected to 100% step changes in stack gas flow rate, SO2 concentration and NO2 concentration. The return to steady state occurred within 20 sec after the step change, and the dynamic SO2 removal efficiency was always greater than 90%. The lead chamber process produces both sulfuric and nitric acid to high concentrations, but is unable to use flue gas to produce the H2SO4. The Tyco process is similar to the lead chamber process but can use flue gas with less than 0.5% SO2.

32178 **APTIC NO. 55064**

Wade, W. R., P. I. Shen, C. W. Owens, and A. F. McLean

LOW EMISSIONS COMBUSTION FOR THE REGENERATIVE GAS TURBINE: PART I--THEORETICAL AND DESIGN CONSIDERATIONS. *Preprint, American Society of Mechanical Engineers, 17p., 1973. 38 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Washington, D. C., April 8-12, 1973, Paper 73-GT-11.)*

The basis for designing a practical low emission combustor for an automotive regenerative gas turbine engine is described.

The low emission combustor described uses the concept of burning a premixed, lean, homogeneous mixture for accurate control of combustion temperatures. Increasing the combustor inlet temperature above approximately 300 F had a beneficial effect on the nitrogen oxides gm/mi values when the optimum flame temperature is maintained in the combustor primary zone. The combustor also achieves good fuel economy at high inlet temperatures. The Externally Vaporizing Combustor (EVC) which is described consists of three zones: the premix zone where a homogeneous air-fuel mixture is prepared; the primary zone where this mixture undergoes combustion; and the dilution zone where the combustion products are diluted to the turbine inlet temperature. The most promising method of generating a premixed, lean, homogeneous, air-fuel mixture is discussed. A practical EVC combustor utilizing these concepts is compatible with a vehicular gas turbine engine. The key to applying this concept in an engine subjected to transient operating conditions is precise control of flame temperature within a narrow band, such that low emissions are always maintained. To achieve flame temperature control variable geometry in the open hole area of the combustor the ratio of primary to total airflow must be changed. No penalty in engine performance is experienced with the application of the EVC combustor to a vehicular gas turbine engine since it can operate at the cycle conditions. (Author summary modified)

32179 **APTIC NO. 54417**

Wanke, Sieghard E.

OXIDATION OF PROPANE OVER A DIESEL EXHAUST CATALYST. *Can. J. Chem. Eng., 51(4):454-458, Aug. 1973. 19 refs.*

The oxidation of propane over a concentration range of 0.30 to 1.04 mole% in air was investigated over a commercial diesel exhaust catalyst consisting of cuprous oxide, chromium oxide, and palladium supported on alumina. The rate of reaction was correlated by a first order, irreversible rate function; the resulting preexponential factor and activation energy were 3.15 times 10 to the 7th power cc/g sec and 21.3 kcal/g mole, respectively. At high temperatures the reaction rate became influenced by pore diffusion. A temperature of 675 K was required to obtain 50% propane conversion. This catalyst is unsuitable for catalytic mufflers on diesel buses since the measured value of diesel exhaust temperatures at the catalytic muffler inlet is significantly less than 675 K. (Author abstract)

32180 **APTIC NO. 54185**

Watari, Shinjiro

THE MANUFACTURE OF ACTIVATED CARBON. *(Kasseitan no seizo). Text in Japanese. Preprint, Japan Society of Chemical Engineering, Tokyo, Kanto Branch, p. 12-17, 1973. (Presented at the Japan Society of Chemical Engineering, Study Meeting, Tokyo, Japan, Sept. 21, 1973.)*

Activated carbon can be used to adsorb various pollutants. Its manufacture using caking bituminous coal was studied. The spherically shaped coal is heated to about 300 C under hot air containing 10% oxygen and is then heated to 500-800 C for tar and gas removal and for formation of a micro-pore structure. The coal is then steam activated at 800-900 C (1-5 kg of steam/kg of coal).

32181 **APTIC NO. 54456**

Watt, David A.

METHOD FOR INSERTION OF PARTICULATE CATALYTIC MATERIAL IN A CATALYTIC CONVERTER HOUSING. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,713,782. 4p., Jan. 30, 1973. 9 refs. (Appl. April 15, 1971, 1 claim).*

A method for placing a predetermined quantity of particulate catalytic material within the housing of a catalytic converter for the purification of motor vehicle exhaust gas is described. A gas permeable and preferably heat decomposable material is used to form a container having a full opening. The container is filled with particulate catalytic material, after which the filled container is inserted in the catalytic converter housing. The use of this method is particularly advantageous because the bed of catalyst particles can be inserted as a unit into the converter housing. The catalytic converter may then be installed in the exhaust system of a motor vehicle. Subsequent use of the motor vehicle s engine will create hot exhaust gases which will be capable of passing through the gas permeable catalyst container. If the material from which the container is made is heat decomposable, it will be decomposed by combustion or other chemical or physical process. (Author abstract modified)

32182 **APTIC NO. 54582**

Weigert, Wolfgang, Edgar Koberstein, and Eduard Lakatos

CATALYSTS FOR THE PURIFICATION OF AUTO EXHAUSTS. *(Katalysatoren zur Reinigung von Autoabgasen). Text in German. Chemiker-Ztg. (Heidelberg), 97(9):469-478, 1973. 28 refs.*

The most important reactions taking place during catalytic purification of automobile exhausts are described, and the influence of the reaction parameters such as pollutant concentration, reaction temperature, pressure, velocity, and effective residence time on the reaction processes are discussed. The essential reactions taking place during the catalytic removal of pollutants are listed in a table. The temperature dependences of the reaction enthalpies in the various operating temperature zones, as well as the equilibrium constants are given in this table. All listed reactions are exothermal. Another table lists data provided by the available literature for the oxidation kinetics of hydrocarbons. The oxidizability of various hydrocarbons on a non-precious metal, and on a non-precious metal/precious metal catalyst is illustrated in a graph. Methane is most difficult to oxidize, acetylene is most readily oxidized. The reaction ability rises with rising carbon number. The composition and function of oxidation and reduction catalysts is reviewed, and various support and active materials for catalysts are described.

32183 **APTIC NO. 54642**

Weinlein, Hans-Karl

THE THERMAL ELIMINATION OF PRODUCTION RESIDUES IN THE CHEMICAL AND RELATED INDUSTRIES. *(Die thermische Beseitigung von Produktionsrueckstaenden in der chemischen und verwandten Industrie). Text in German. Chem. Ind. (Duesseldorf), 25(9):581-585, Sept. 1973.*

The wastes from chemical and related industries range from solid to pasty to liquid. For such heterogeneous waste whose heating values vary widely, the rotary kiln is frequently used. Three examples are illustrated. Many of them are operated with waste heat boilers. Electrostatic precipitators are used for waste gas cleaning if no aggressive pollutants are present. In the case of a rotary kiln operating in a synthetic leather manufacturing plant, the hydrogen chloride containing flue gases are cleaned in scrubbers preceded by a neutralization stage whose scrubbing fluid is taken from the lye treatment station from sludge conditioning. In many cases exclusively pasty or liquid wastes have to be incinerated. In such cases the fluidized bed furnaces or high-capacity combustion chambers are applied. A decision between the two methods must take place on the basis of economy. Illustrations for both types are given. A fluidized bed furnace with air preheater is equipped with a coarse dust collector and venturi scrubber with neutralization for waste gas cleaning. An example of a high-capacity combustion chamber uses an electrostatic precipitator for separation of the metal oxides, and acids are recovered by absorption.

32184 **APTIC NO. 54376**

Westenberger, J. A. and Neil H. Mermelstein

SOLVING AIR POLLUTION PROBLEMS. Food Technol. (Chicago), 27(2):44, 46-47, Feb. 1973.

The Thermal Regenerative Air Purification System (TRAPS) to control air pollution problems caused by fumes and odors overcomes the drawbacks associated with afterburners. It operates essentially as an afterburner, but gives a high degree of purification of process exhaust gases with greater heat recovery and consequently lower fuel costs, and fouling is minimized. The system consists of several modules, each consisting of essentially three zones: an inlet/preheat zone, a purification zone, and an exhaust/heat recovery zone, which is identical to the preheat zone. The preheat and heat recovery zones contain a high efficiency heat transfer medium consisting of ceramic saddles similar to those used in distillation towers. This medium stores heat extracted from the purified gases and gives it up to the incoming exhaust gases. The equipment is designed to operate with purification temperatures as low as 1200 F and as high as 1600 F and will thus meet existing code requirements as well as expected future needs. Although the capital costs are higher than those for afterburners with heat recovery, the savings in fuel costs make the TRAPS system more economical in the long run. This system has been applied to food processing operations.

32185 **APTIC NO. 55193**

Wilson, D. G. and N. R. Dunteman

THE INVERTED BRAYTON CYCLE FOR WASTE HEAT UTILIZATION. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1973. 4 refs. (Presented at American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Washington, D. C., April 8-12, 1973, Paper 73-GT-90.)*

The inverted Brayton cycle can be simply defined as one in which hot gas is first expanded through a turbine to low pressure, is then cooled at constant pressure, and is recompressed to the initial pressure. It gives attractive incremental gains in thermal efficiency and large returns on investment, when added to a conventional shaft-power gas turbine exhausting into a waste heat boiler. When the inverted Brayton cycle is applied by itself as a method of obtaining shaft power from the hot waste gas stream, there appears to be a range of temperature and pressure ratios at which the cycle is competitive with other methods of waste heat utilization. (Author abstract)

32186 **APTIC NO. 54416**

Woodis, Terry C., Jr., James M. Cummings, Jr., and G. Bradley Hunter

VOLUMETRIC METHODS FOR CONTROL OF AMMONIA SCRUBBING PROCESS FOR REMOVAL OF SO2 FROM STACK GASES. *Environ. Sci. Technol., 7(9):827-828, Sept. 1973. 6 refs.*

Volumetric methods for analytical control of the ammonia scrubbing process were developed from standard analytical procedures. Results of three titrations are sufficient to calculate the concentrations of ammonium bisulfite, sulfite, and sulfate in the scrubber liquor before or after the liquor is acidified with ammonium bisulfate and stripped of its SO2. Two titrations are sufficient to determine the composition of the ammonium bisulfate that is used to strip the scrubber liquor. The only interfering ion is chloride, and this is determined by titration with silver nitrate, and a suitable correction is applied. (Author abstract)

32187 **APTIC NO. 54361**

Wright, John K.

THE FEASIBILITY OF THE ELECTROLYTIC TREATMENT OF SULPHIDE CONCENTRATES. *PACE, 26(6):9-12, 14, 16, June 1973. 18 refs.*

The electrolytic treatment of metal sulfide concentrates from smelting, sintering, or roasting to form elemental sulfur is discussed. The design of efficient electrodes that will maintain electrical contact between the concentrate particles and the current supply is one of the main problems in the direct electrolysis of sulfide concentrates. An electrode that is formed by mechanically compacting a finely divided sulfide concentrate is mechanically weak and breaks down as electrolysis proceeds. An indirect electrode process involves the oxidation of a solute species in the electrode and which in turn oxidizes the sulfide mineral. The ferric-ferrous ion system offers the most promise. A sulfide slurry electrode is an attractive system because no preparation of the sulfide concentrate is required. Every effort is made to keep iron content low because it lowers the current efficiency of electrolytic processes. Polarization can also seriously limit reaction rates. Three processes are proposed which incorporate slurry electrodes and reject the iron content of the sulfide concentrate as insoluble ion hydroxides. They are anodic oxidation in neutral electrolyte, acid solution, and ammonia solution. This treatment provides for the recovery of metals without the production of sulfur dioxide.

32188 **APTIC NO. 54893**

Yazawa, Masaharu

CLEANING EQUIPMENT FOR SMOKE. *(Baien seijo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-13475. 2p., April 12, 1973. (Appl. March 12, 1969, 1 claim).*

Smoke cleaning equipment is designed for the discharge of smoke and exhaust gas of combustion furnaces. The smoke and other gases are injected through nozzles with a large number of holes at the bottom of a cleaning tank into a cleaning liquid and then passed through a filtering plate, which is washed by a watering pipe. The upper part of the equipment is provided with a gas discharge opening so that it can be connected with the stack. The upper part of the cleaning tank is provided with an inclined filtering net plate. The watering pipes are equipped with a large number of holes above the filtering plate. The tip of the nozzle is provided with a plate valve with holes so that it can be opened and closed, and the other end of the nozzle is connected to the smoke inlet pipe which is equipped with an air blower and a backcurrent preventive plate.

1972

32189 **APTIC NO. 54694**

Bureau of Mines

BUREAU OF MINES RESEARCH 1972: A SUMMARY OF SIGNIFICANT RESULTS IN MINING METALLURGY AND ENERGY. *88p., 1972. 795 refs.*

GPO

Results of a variety of scientific and engineering investigations including the extraction, processing, use, reuse, and disposal of minerals and fossil fuels are described. Mine health and safety, explosions research, rock mass behavior and control, mineral processing, hydrometallurgy, pyrometallurgy, recycling, adaptive metallurgy, coal research, petroleum research, natural gas research, environmental studies, and oil shale research are covered by a series of articles. The environmental studies include disposal of oilfield brines, fuel desulfurization, fuels combustion, and plugging and mining coal through oil and gas wells.

32190 **APTIC NO. 54717**

Committee on Commerce

THE PRICE OF POWER. ELECTRIC UTILITIES AND THE ENVIRONMENT. *In: Energy Research and Development. 92nd Congress (Senate), First Session, Amendment No. 364 to S. 1684, Serial No. 92-62a, p. 237-*

288, March 15 and 16, 1972. (Hearings before the Committee on Commerce.) (Also: Econ. Priorities Rept., 3(2), May/June 1972.

GPO

The Council on Economic Priorities assessed the environmental records of 129 major generating plants operated by 15 U. S. investor-owned power companies; the plants were of the fossil- fuel, nuclear, and geothermal varieties. Profiles of Southern California Edison, Southern Company, and Consolidated Edison of New York are reported, along with selected plant profiles for each company. The environmental price paid for the all electric environment is assessed in terms of the environmental and health effects of the soot and smog, radioactivity, and waste heat generated by the power plants. Particulates, sulfur dioxide, nitrogen oxides, and carbon dioxide are discussed. The technology available for controlling these pollutants includes: electrostatic precipitators, baghouses, wet scrubbers, mechanical collectors, use of low-sulfur fuel, limestone scrubbing, magnesium scrubbing, catalytic oxidation, and nitrogen oxide techniques. Alternatives to electric power are considered, including hydroelectric power and pumped storage, solar energy, geothermal steam, the tides, wind, and steam-cycle generators. Techniques under consideration for converting fuel more directly into electricity include magnetohydrodynamics, fuel cells, and recycling waste heat from power plant condensers. Coal gasification is one method for the cleaner utilization of coal, and the establishment of a national power grid might help in obtaining more power from present sources. The advertising techniques used by the utilities to encourage the public to consume more power are discussed, as are some of the campaigns used recently to urge the public to conserve power.

32191 **APTIC NO. 54367**

Akhmedov, Rustan Berovich, Zakhidzhan Sadykdzhanovich Talibdzhanov, Asomkhodzha Valikhodzhaev, and Faizulla Karimovich Rashidov

BURNER DEVICE FOR COMBUSTION GASES. *(Assignee not given.) U. S. Pat. 3,664,587. 4p., May 23, 1972. 9 refs. (Appl. Jan. 22, 1970, 5 claims).*

A burner device for combustion gases specifically applicable to boiler units incorporates whirlers for both gas and air which are capable of variation in the whirling intensity of the gas and air streams and in the direction of rotation and length of mixing path. The device accommodates a whirler for air and at least one gas-feeding pipe fitted with a whirler. Each of the burners is fashioned as a rotary piece thus enabling variation of the place of gas and air stream admission as well as the cross-section of the channel at the place of admission. The mutual turning of the rotary pieces insures variable directing of the two streams. Hence, the thermal characteristics of the torch can be controlled within a wide range by varying the whirling intensity of the gas and air flow and the place of their admission. As a whole, the invention improves the operational characteristics and raises the heat efficiency of furnace units, improves the operating conditions of heating surfaces, and reduces the range of temperature control of superheated steam and outgoing gases, thus increasing the efficiency and reliability of boiler units.

32192 **APTIC NO. 54363**

Alliger, Howard

MULTIPLE SCREEN CONSTRUCTION. *(Assignee not given.) U. S. Pat. 3,659,402. 4p., May 2, 1972. 9 refs. (Appl. March 30, 1970, 2 claims).*

A multiple screen construction for an air pollution control apparatus used in the cleaning of contaminated gases was designed to eliminate the clogging of screens associated with prior devices of a similar nature by the tight securement of screens with each other. The construction involves an epoxy coated screen network of several tightly bound screens, decreasing in mesh sizes in the direction of movement of the gases to be cleaned. Water is directed onto the screens from a position in advance of the screen network so that the water is sprayed on and between the screen surfaces substantially filling the entire network as a continuous sheet with no voids. The contaminated gases which impinge upon the screen network are thoroughly mixed with the water in countless paths thus formed. All contaminant particles become completely wetted; and the water carrying the trapped pollutants may then be disposed, while the clean air continues through the screen network and out of the apparatus. The larger mesh screens in the network aid in eliminating large soot particles and thus prevent the clogging of the finer mesh screens. The flow of water from a location in advance of the screen network causes the water and gases to enter the screen network together and thus mix better while preventing clogging of the larger mesh screens.

32193 **APTIC NO. 54439**

Alverson, Thomas Edward

SPARKOVER IN NEGATIVE CORONA AS INFLUENCED BY A DUST LAYER ON THE ANODE SURFACE. *Carnegie-Mellon Univ., Pittsburgh, Pa., Dept. of Electrical Engineering, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 134p. 22 refs.*

In this study of sparkover voltage between a wire and an anode surface covered with high resistivity dust, circular patterns were observed on the dust surface. The occurrence of this phenomenon was related to a dielectric breakdown in the dust layer. It is hypothesized that ion pairs were formed in a high electric field at the dust surface. With the electrons moving quickly to the anode, a concentration of positive ions remained. The dust particles in this region obtained a positive charge and were thrown from the surface. In studying the effects of dust thickness on sparkover voltage, a minimum sparkover voltage was obtained in a test apparatus with samples of dust having a breakdown strength of approximately 20 kv/cm. The minimum voltage occurred with these dusts when the thickness was approximately .060 in. Three samples of fly ash were separated into particle sized fractions. For each sample the resistivity of the fine fraction was higher than the resistivity of the whole fly ash. However, the sparkover voltage with the fine fraction on the anode was definitely not lower than the one with the whole fly ash on the anode for similar conditions of humidity and thickness. The higher breakdown strength of the fine fraction was thought to be the reason for this behavior. (Author abstract modified)

32194 **APTIC NO. 54653**

Angilly, Fredrick Ernest, Jr., George Lindol Miner, and Lionel Anthony James Sousa

ROTARY AIR FILTER CLEANING APPARATUS. *(Grinnell Corp., Providence, R. I.) U. S. Pat. 3,667,195. 8p., June 6, 1972. 11 refs. (Appl. March 16, 1970, 5 claims).*

A vacuum cleaning device for cleaning a rotary drum filter has been designed to overcome previous limitations on the length of the drive screw and the length of the equipment which can be serviced by a single suction nozzle. The drive screw for moving the suction nozzle axially across the rotary drum is supported by two movable bearings, in addition to end bearings. The movable bearings are positioned on guide members which are parallel to the drive screw to support the screw against sagging at locations between the suction nozzle and the end bearings. Spacing of the bearings is accomplished by rigid connecting rods. These rods pull one of the movable bearings along to support the drive screw as the other movable bearing is pushed along the guide member by the advancing suction nozzle. (Author abstract modified)

32195 **APTIC NO. 54368**

Barkovitz, William E. and Julius V. Przygocki

FLOW BALANCING RESTRICTION IN GAS SCRUBBER. *(American Standard Inc., New York) U. S.*

Pat. 3,664,094. 7p., May 23, 1972. 1 ref. (Appl. July 27, 1970, 9 claims).

A three-state wet dust collector has been designed with an improvement comprising a discharge tube for conveying concentrated dust from the inertial separator to a location downstream of its packing section and a restriction in the discharge tube for exerting a resistance to flow through the tube in proportion to the flow resistance of the packing. The device consists of an inertial separator section for removing a substantial percentage of the dust particles from the treated gas stream; a porous packing of thin gauge strips (0.004-0.010 in. thick) made of aluminum, resin-impregnated wood fiber, plastic, ore resin-impregnated asbestos which is subjected to a flushing liquid for producing a concentrated fog to assimilate the remaining dust particles; and a second separator section for removing the wet dust particles from the gas stream. The first inertial section includes a special flow-limiting nozzle which exerts a balancing pressure drop on the flow of separated dust particles to achieve proper particle separator flows.

32196 **APTIC NO. 54282**

Bartok, William, Allen R. Crawford, Victor S. Engleman, and Alvin Skopp

CONTROL OF NITROGEN OXIDE EMISSIONS IN COMBUSTION. *Preprint, European Federation of Chemical Engineering, 32p., 1972. 7 refs. (Presented at the International Congress of Chemical Engineering at the Service of Mankind, Paris, France, Sept. 2-9, 1972.)*

The nature of stationary nitrogen oxide emission problems was characterized for the U. S. Oxides of nitrogen are formed in all fossil fuel/air combustion processes, which are responsible for about 90% of all man-made, stationary NOx emissions in the U. S. Available and potential control technology is subdivided into combustion modification techniques which minimize the formation of NOx and into combustion flue gas treatment techniques for the removal of the NOx already formed. As the bulk of the NOx is present as low concentrations of unreactive nitric oxide in huge volumes of flue gas, practical removal techniques will be exceedingly difficult to develop. In contrast, the outlook for applying relatively simple combustion operating or design modifications for NOx control is promising, particularly for gas or fuel oil fired equipment. Preliminary results available to date indicate that it will be much more difficult to apply such modifications to coal-fired installations, and therefore, intensive future research is required. (Author summary)

32197 **APTIC NO. 54495**

Bassler, Friedrich

SOLAR DEPRESSION POWER PLANT OF QATTARA IN EGYPT. *Solar Energy, 14(1):21-28, Dec. 1972. 8 refs.*

The solar depression power plant of Qattara in Egypt was investigated. In the Libyan Desert of North Africa, only 80 km away from the Mediterranean, there is a vast depression 300 km long and 150 km wide. The floor at its lowest point is 135 m below sea level. If seawater is conducted to the northern edge of this depression by an open channel or an underground supply line, the difference of elevation between the Mediterranean and the bottom of the depression can be used for generating power in water turbines. Although the depression has no outlet, the utilized water is subjected to very high evaporation from this area. The average remaining evaporation is 1800 mm/yr. Optimum efficiency of the power plant is achieved when equilibrium prevails between the amount of water flowing in and the amount evaporating by the sun s energy into the atmosphere. In the Qattara Depression near El Alamein this state can be achieved as soon as the water level reaches 60 m corresponding to a surface area of 12,000 sq m and to an annual evaporation volume of more than 20,000 million cu m. Thus a seawater discharge of at least 650 cu m/sec can be continuously fed into the turbines of the power plant without the level in the new Qattara Basin rising any further. The capacity attainable with this hydrosolar scheme combined with pumped storage reaches about 4000 MW peak load energy. (Author abstract modified)

32198 **APTIC NO. 54364**

Baudry, Jean

DEVICE FOR REDUCING THE EMISSION OF POLLUTION RESPONSIBLE PRODUCTS BY EXTERNAL CARBURETION ENGINES DURING THE DECELERATION PERIODS. *(Inst. Francais du petrole, des Carburants et Lubrifiants, Rueil Malmaison (France)) U. S. Pat. 3,688,752. 12p., Sept. 5, 1972. 3 refs. (Appl. June 24, 1970, 17 claims).*

A description is given of a new automatic device which permits a reduction in the emission of unburned hydrocarbons from external carburetion engines during the deceleration periods of these engines. This device bypasses the drawbacks of other available means for reducing such emissions by providing: means for completely suppressing, during deceleration periods, the flow of the carburetted mixture feeding into the cylinder; and means for admitting noncarburetted air into the cylinder during the deceleration periods. Under these conditions, the emission of unburned hydrocarbons can be almost completely eliminated without any bump in the operation of the engine. The device itself is connected to at least one inlet pipe opening into at least one cylinder through an orifice provided with a means for its intermittent closure; the device is equipped with an idling fuel supplying circuit.

32199 **APTIC NO. 55008**

Baum, Harold M.

ANIMAL LITTER AND PROCESS. *(SCM Corp., Cleveland, Ohio) U. S. Pat. 3,636,927. 4p., Jan. 25, 1972. 3 refs. (Appl. June 18, 1970, 7 claims).*

An effective odor masking and/or inhibiting litter material for animal environments has been developed from a group of compounds known as camphane derivatives. Two representative examples, both having the odor of cedar, are 2-isopropoxy-camphane and 2-(beta-hydroxyethoxy)-camphane. The amount of such compounds used in the odor-inhibiting composition may vary between 0.1 and 25 wt% and will depend upon the carrier used, the amount of odor to be inhibited, and the length of inhibition desired. The carrier employed can be any carrier conventionally used as as animal litter with the provision that it be inert. Suitable solid inorganic carriers include siliceous minerals such as clays as well as synthetically prepared siliceous materials such as silica aerogels and precipitated and fume silicas. Suitable solid organic materials include wood chips, excelsior, shredded polymers, and the like. The camphane derivatives are generally liquids at room temperature, and the composition of the invention can be formed by any conventional way of contacting a solid with a liquid. The composition may also include a conventional insect repellent.

32200 **APTIC NO. 55009**

Bechtold, Max Fredrick and Charles William Tullock

POWER GENERATION WITH RANKINE CYCLE ENGINES USING ALKYLATED ADAMANTANES AS A WORKING FLUID. *(E. I. du Pont de Nemours and Co., Wilmington, Del.) U. S. Pat. 3,648,456. 4p., March 14, 1972. 2 refs. (Appl. Aug. 17, 1970, 5 claims).*

Adamantanes substituted at one or more of the bridgehead positions with lower alkyl groups, preferably methyl groups, to possess an outstanding combination of properties which render them suitable as working fluids for Rankine cycle heat turbine engines and particularly for low power turbines. Alkyladamentanes having from one to four lower alkyl bridgehead substituents are generically useful as working fluids for Rankine cycle engines, a representative example being 1,3-dimethyladamantane. The invention is based on the discovery that the al-

kyladamantanes have surprisingly high critical temperatures in combination with suitable boiling points for the design of small, air-cooled condensers in combination with other desirable properties. The alkyladamantanes exhibit exceptional thermal stability in contact with the common metals of engine construction and as working fluids have good lubricity, thus permitting the use of the working fluid as a bearing lubricant in engines. They also exhibit low toxicity as a class of compounds. Mixtures of aldyladamantanes which have lower melting points than the pure compounds can also be employed.

32201 **APTIC NO. 54619**

Belteky, L.

DEVELOPMENT AND UTILIZATYON OF THERMAL WATERS IN HUNGARY. *Geothermics, 1(3):103-112, Sept. 1972. 7 refs.*

The development and utilization of thermal waters in Hungary are summarized. The total number of thermal water wells with a water temperature above 35 C on Jan. 1, 1972 was 466. Utilization of thermal waters developed in two directions: in heating for balneological purposes and in heating for agricultural, especially horticultural, facilities. The development and extension of thermal water utilization is characterized by the increase in thermal water wells (35-40 wells yearly) in recent years. The most important economic problem is the multipurpose use of the thermal energy which means a successive step like utilization of the thermal waters. Other uses include industrial purposes, water injection and water level observation, and multipurpose utilization of gas producing water wells. The chemical composition of thermal waters influences utilization. According to chemical analyses, 46% of thermal water occurrences represent bicarbonate types, 28% are of iodide-bromide character, and 14% are simple thermal waters. Eighty-six percent of the thermal waters are considered to be mineral waters. An increase in thermal water production is accompanied in some places by scaling problems and often discourages many people from utilizing geothermal water energy. They are being solved by prevention of scaling and removal of the precipitate by drilling and/or acid treatment. To insure operational security, the National Water Authority requires periodical compulsory measurements and maintenance of thermal wells.

32202 **APTIC NO. 54537**

Bethea, Robert M.

SOLUTIONS FOR FEEDLOT ODOR CONTROL PROBLEMS--A CRITICAL REVIEW. *J. Air Pollution Control Assoc., 22(10):765-773, Oct. 1972. 52 refs.*

Air pollution and odor control problems associated with animal feedlots and poultry houses are reviewed. The waste production from cattle, swine, poultry, and sheep is about 2 billion tons annually. Present methods of waste handling concentrate on decomposition of the manure with little emphasis on control of air pollution. Air pollution from animal feedlots cause impairment of health and productivity of the animals and a continuous production of large amounts of odoriferous gaseous materials. There are many methods of control as applied to excreta: odor prevention by modification of feed rations; odor reduction by recycle manure feeding and by improved waste handling procedures; odor control by chemical reaction, ozonation, gas washing and scrubbing, combustion; and odor elimination by thermal and catalytic oxidation. The elimination of odors by incorporating humic acid into the feed ration appears to offer a promising possibility as a control technique for cattle, swine, and sheep feeding operations. If that is not feasible and if the animals cannot be enclosed in barns with ozone treated air because of adverse animal response to such an atmosphere, catalytic incineration of the air should be attempted. Incineration of the solid waste should provide adequate energy for preheating the barn ventilation air to 660-750 F. prior to combustion. If necessary, the exhaust gases from the solids incineration step could also be recycled through the catalytic oxidation step.

32203 **APTIC NO. 55058**

Blanc, H. and M. Maulaz

RECUPERATION AND DESTRUCTION OF WASTE OILS AND OTHER COMBUSTIBLE LIQUID WASTES OF ALL KINDS. *American Society of Mechanical Engineers, New York; Proc. Natl. Incinerator Conf., New York, 1972, p. 61-65. (June 4-7.)*

Lausanne, Switzerland developed at 770 lb/h incinerator for the destruction of hydrocarbon and other liquid wastes varying greatly in calorific value, viscosity, and organic and mineral content. It is the main element in a collecting and processing center open to the canton of Vaud. The wastes are transported to the incinerator by the client, after which coarse suspended solids and oils are removed from wastes containing greater than 2% water. The wastes are injected into the incinerator via a spray nozzle which allows for the adjustment of the air flow and fuel supply to provide a thorough mixture favoring complete combustion. The sulfur dioxide emissions vary between 0.3 and 0.4 ppm, while carbon monoxide is emitted in peaks of 300 to 500 ppm for a few minutes during starting. Dust concentrations of 0.027 mg/cu m have been measured in the immediate vicinity of the incinerator. The unit makes provision for waste heat recovery, with the heat produced being destined for supply to a housing district where it will be used for heating and hot water. The plant and construction costs total $664,500, while the operating costs per million Btu is $0.14.

32204 **APTIC NO. 55147**

Bonhote, P. A., G. G. May, H. J. Polson, and R. Weir

REMOVAL OF RADIOACTIVE IODINE FROM VENTILATION EXHAUST STREAMS AT THE A.A.E.C. RESEARCH ESTABLISHMENT. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 114-119. 13 refs. (May 15-18.)*

Design criteria for the removal of radioactive iodine from ventilation exhaust streams at the Australian Atomic Energy Commission Research Establishment are presented. Radioactive iodine is usually the most important nuclide to be considered in assessing the risk of possible releases of fission products since it is volatile, abundant in fission products, and selectively concentrated in the thyroid gland. Impregnants have been found which considerably improve charcoals used to eliminate the heretofore difficult to control methyl iodide fraction. The charcoals used are 8/12 mesh 207 B impregnated with 5% triethylenediamine and 8/12 mesh 207 B impregnated with 1.5% potassium iodide. Important factors in the design of charcoal beds are: uniform packing of charcoal to an even depth, dense packing, removal of charcoal fines, mechanical constraint of the bed, ease of bed removal, long working life, size of charcoal granules, and protection of the bed against water droplets or condensing steam. Although downdraft beds are considered preferable to other configurations, a modular bed has been developed for systems where sufficient headroom is not available for loading and where use with upflow, downflow, or horizontal flow is desired. The design of such a unit is depicted diagramatically, and test results of methyl iodine penetration as compared to that of downdraft beds are given. In situ tests of downdraft beds after 14 months of operation showed a penetration of 7.6 times 10 to the minus 3 of methyl iodide; a modular bed on standby for the same period had a penetration of methyl iodide of 6.1 times 10 to the 4, which though disappointing may have been due to dioxtyl phthalate vapor arising from a high efficiency filter located immediately above. The beds have a useful working life of one year.

32205 **APTIC NO. 55097**

Bothe, Rolf

DUST TRAPPING DEVICES IN SINTERING AND PELLETISING PLANTS. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 255-260. (May 15-18.)*

Trends toward the use of various dust trapping devices in sintering and pelletizing plants throughout Europe are presented. Dry-type electro-precipitators are presently used for the collection of dust from gases produced in sinter plants since wet precipitator installations would require an unnecessary installation of a water and sludge system in the agglomeration plant. Pelletizing plants generally use centrigugal dust collectors, and no such trend towards dry-type electro- precipitators is noticeable. The use of scrubbers may be of advantage in some cases, and the water and sludge system required by the wet precipitator installation could be combined with the wet grinding equipment on order to afford lower investment and operating costs of wet electro-precipitators. Extensive room dedusting installations generally consist of adequate enclosures for the equipment and transport systems, aerodynamically-designed aspiration systems, and correct dust collecting equipment. Either central or individual dust collectors are employed depending on plant arrangements and on the possibility of reusing part or all of the dust separated. In large plants the tendency towards central dust collecting installations prevails.

32206 **APTIC NO. 54833**

Brannland, Rolf Karl August, Per-Erik Ingemar Alsefelt, and Hans Otto Gyllensten

PROCESS FOR REPLACING SODIUM AND SULFUR LOSSES AND FOR CONTROLLING THE SULFIDE CONTENT IN SODIUM- AND SULFUR-CONTAINING CELLULOSIC DIGESTING LIQUORS. *(Mo och Domsjo Aktiebolag, Ornskoldsvik (Sweden)) U. S. Pat. 3,654,071. 4p., April 4, 1972. 6 refs. (Appl. May 10, 1968, 16 claims).*

A process has been developed for recovering inorganic chemicals from black liquor obtained in a kraft or sulfate pulping process and replenishing the lost sodium and sulfur at a considerably decreased cost while minimizing losses of pollutant gases to the atmosphere and controlling sulfidity of the regenerated white liquor. A sodium and sulfur-containing acidic waste liquor from an auxiliary cellulose pulp-treating, processing, or utilization process is combined with the inorganic chemicals recovered from kraft black liquor in an amount to replenish the sodium and sulfur losses and regenerate a white liquor for reuse as a kraft pulping liquor. Any excess sulfur is removed to restore sulfidity to a proper balance by separating hydrogen sulfide, the acidity of the resulting solution being so adjusted as to liberate the sulfur as hydrogen sulfide in an appropriate amount. The acidic waste liquor can be added to the recovered inorganic chemicals at any stage in the recovery process; addition to the green liquor is preferred, however. The pH following addition of the waste liquor should be about 5 to 7, and the temperature should range from 50 to 80 C; under these conditions, hydrogen sulfude is liberated freely in a single stage or in several stages.

32207 **APTIC NO. 54312**

Brenneke, Arthur M.

METHOD AND APPARATUS FOR REDUCIN G EXHAUST EMISSIONS DURING ACCELERATION. *(TRW Inc., Cleveland, Ohio) U. S. Pat. 3,659,415. 4p., May 2, 1972. 6 refs. (Appl. Aug. 17, 1970, 1 claim).*

A system for reducing exhaust emissions during acceleration of an internal combustion engine, particularly a diesel engine, has been developed by providing additional high-pressure air directly to the cylinders of the engine during the compression stroke at the start of acceleration. The system incorporates an engine-driven compressor and high-pressure compressed air storage tanks. A timed distributor is provided to sequentially supply high-pressure compressed air to several conduits communicating the distributor directly to the cylinders of the engine during the compression stroke. Switching is also provided to initiate activation of the system at the start of acceleration and to terminate actuation of the system when the normal air supply to the cylinders is sufficient to combust the fuel being supplied. A modified form of the invention provides for a dual distributor which allows the system to be used for starting the engine by providing high-pressure gas to the cylinders during the power stroke.

32208 **APTIC NO. 54637**

Bridge, Alan G.

DESULFURIZATION. *(Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,663,434. 6p., May 16, 1972. 8 refs. (Appl. Jan. 12, 1970, 8 claims).*

A process for the hydrodesulfurization of heavy oils contaminated with organometallic impurities such as organic iron compounds has been developed which avoids formation of a high pressure drop plug due to metals deposited at the top of the catalyst bed. The heavy oil and hydrogen are passed at a temperature of 500-800 F and a pressure of 200-2000 psig through a first fixed catalysts bed which has progressively more active hydrogenation catalyst compositions along the normal direction of feed flow in order to spread out the deposits of iron in the first fixed bed. A portion of the effluent from the first bed is passed at a temperature of 500-900 F and a pressure of 200-3000 psig in the presence of hydrogen through a second fixed bed containing hydrodesulfurization catalyst particles having a surface area of at least 100 sq m/g and having a predominantly microporous structure. The second bed consists of catalyst composites comprising discrete insoluble metal phosphate particles surrounded by a continuous phase matrix of at least one solid oxide and at least one hydrogenating component selected from Group VI-B metals or compounds and Group VIII-B metals or compounds.

32209 **APTIC NO. 55056**

Bridge, D. P. and J. D. Hummell

INCINERATOR DESIGNED SPECIFICALLY TO BURN WASTE LIQUIDS AND SLUDGES. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, p. 55-60. (June 4-7.)*

Two new prototype incinerators have been developed to handle waste liquids and sludges from paint and resin plants. With these designs, it has been possible to achieve the following: compete combustion without fluid atomization, combustion of organic liquids containing dissolved and suspended solvents, low noise levels, smoke-free stack effluents without the use of air pollution control equipment, self-sustaining combustion following initial preheating, and a potential for heat recovery. Since November 1970, the first operational and instrumented unit has been used to burn the organic waste liquids from a resin plant. An operational unit of the second type has been designed to burn paint manufacturing wastes containing inorganic pigments. Performance and particulate emission data are not yet available. (Author abstract modified)

32210 **APTIC NO. 54502**

Briggs, Warren S. and Frank G. Ciapetta

EXHAUST GAS OXIDATION CATALYST AND PROCESS. *(W. R. Grace and Co., New York) U. S. Pat. 3,661,806. 5p., May 9, 1972. 6 refs. (Appl. Jan 5, 1970, 3 claims).*

An improved internal combustion engine exhaust gas oxidation catalyst has been developed which is resistant to poisoning by lead salts and other exhaust components, is stable to temperatures encountered in catalytic exhaust treating systems, and which has a potential useful life in excess of 20,000 miles. The catalyst consists of an alumina matrix and a hydrocarbon and carbon monoxide oxidation promoter selected from the group consisting of palladium, platinum, the oxides of copper, chromium, manganese, magnesium, cobalt, and mixtures thereof. The essential feature of the catalyst is the unique pore distribution of the alumina matrix which allows larger pores to adsorb the lead deposits while leaving the smaller pores free to contact and catalyze the oxidation of exhaust gases. The catalyst has a total pore volume of 0.65-1.20 cc/g and a pore volume distribution whereby 0.20-0.35 cc/g of the total pore volume is in very small pores having pore diameters below 120 A, 0.10-0.25 cc/g of the pore volume is in intermediate sized pores having pore diameters between 120 and 3500 A, and 0.35-0.60 cc/g of the pore volume is in pores with diameters above 3500 A.

32211 **APTIC NO. 55155**

Brink, J. A., Jr. and E. D. Kennedy

MERCURY AIR POLLUTION CONTROL. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 221-226. 18 refs. (May 15-18.)*

The status of mercury air pollution in the United States is outlined in reference to possible sources, laws for control of the pollutant, and control systems and equipment available. An initial inventory of mercury emissions has been made, and Government standards are in the process of being established for such emissions. The expected standard for mercury cell chloralkali plants is expected to be 5 lbs/day. These plants have three exhaust gas streams which contain mercury: hydrogen gas, cell end-box vent air, and cell room ventilation air. The production of mercury from cinnabar ore deposits in the United States gives rise to stack gases which have a mercury content about twice that of the vapor pressure of mercury at the stack gas temperature. Secondary production of mercury is done in closed retorts with no gas flow to the atmosphere, and emissions can be controlled to extremely low levels. Research into control methods demonstrates that mercury mist emissions can be controlled with fiber bed mist eliminators, while vapor emissions can be controlled with adsorbents (packed-bed type) and scrubbers. The design of a mercury mist eliminator for a chlor-alkali plant diagramatically illustrated wherein the problem of mercury accumulation has been largely solved by the use of intermittent water sprays on both sides of the element. A mercury adsorbent system is illustrated which is ideally suited for reducing the mercury content of a gas stream to less than 1 ppb by volume with efficiencies in excess of 99.99%. A brine scrubbing system installed on the hydrogen line of one chlorine plant, after the mist eliminator, is reported to reduce the mercury concentration from 0.25 mg/CF to .03 mg/CF, while an end-box unit has achieved a reduction from 0.3 to 0.04 mg/CF.

32212 **APTIC NO. 54350**

Burmaster, Neal C., Bruce A. Harbolt, and Delbert W. Block

REDUCTION OF AIR CONTAMINATE EMISSIONS FROM STORAGE VESSELS. *(Union Oil Co. of California, Los Angeles, Calif.) U. S. Pat. 3,661,190. 6p., May 9, 1972. 1 ref. (Appl. Sept. 11, 1970, 8 claims).*

A system for reducing the emission of volatilized constituents during the filling of vessels used to transport liquid solutions is presented. The apparatus involved consists of a packed column, preferably 1 in. diameter polypropylene Intalox saddles retained by fluid permeable plates, which has universal means to temporarily be mounted in a vertical position over a vapor discharge port of the transporting vessel. The liquid solution containing the volatile constituent is pumped into a storage tank connected to the inlet of the column to displace from the tank a portion of the residual air which contains an amount of the volatilized constituent. All openings such as vents in the vessel, excepting those which are connected to the columm, are closed, and the displaced air and vapor mixture is forced into the bottom of the column through the vessel opening. A solvent liquid or scrubbing fluid such as water is introduced at the top of the column and passes countercurrent to the rising gas mixture over the packing. The scrubbing fluid absorbs only the contaminate vapors as it passes downwardly in the column and upon reaching the bottom falls directly into the storage tank and mixes with the cargo liquid. The scrubbed gases leaving the column are vented directly to the atmosphere or alternatively are discharged into a common header which vents to the atmosphere.

32213 **APTIC NO. 54616**

Cahill, William Francis, Jr.

APPARATUS AND METHOD FOR INCINERATING RUBBISH AND CLEANING THE SMOKE OF INCINERATION. *(Assignee not given.) U. S. Pat. 3,668,833. 7p., June 13, 1972. 5 refs. (Appl. Aug. 25, 1970, 14 claims).*

An apparatus for incinerating rubbish and cleaning the smoke of incineration is presented. The system consists of a fire pit, a plenum where smoke is collected, a coarse filter, an afterburner, an electrostatic precipitating chamber, an alkaline water wash, a plain water wash, a final filter assembly, and a motor driven exhaust fan which passes clean gas to a stack. The fire pit is preferably installed underground and has chutes associated with it for charging the pit with waste. The draft used to collect the smoke from the fire pit to the plenum is in the nature of 30,000 cu ft/min, and the afterburner operates at a temperature of about 6000 F. The pH of the alkaline water wash, which neutralizes any acid fumes and collects particles which may still be entrained in the smoke, is controlled by an electrometric pH meter on the outside of the chamber. The electrostatic precipitator is of modular design and operates at a potential of 140,000 volts.

32214 **APTIC NO. 54993**

Carbo, Jerry A. and Dennis F. Grady

SLUDGE RETRIEVAL APPARATUS FOR AIR POLLUTION CONTROL SYSTEMS. *(Westinghouse Air Brake Co., Wilmerding, Pa.) U. S. Pat, 3,670,477. 5p., June 20, 1972. 5 refs. (Appl. May 7, 1970, 6 claims).*

An apparatus has been designed for removing and disposing of solid pollutants from a pollutant-laden medium such as water flowing from a dust collector device before discharging such water into a stream or the like. The invention includes a collecting tank into which the pollutant-laden medium is accumulated, an agitator situated within the tank for preventing the pollutants from precipitating to the bottom of the tank, a pump for moving the pollutant medium from the tank to a device such as a foundry sand muller so that the pollutant-laden water may be used for mixing sand with water and a binder in order to filter pollutants from the water when passing through the sand, and a means for actuating the entire apparatus in synchronization with actuation of a conveyor when the latter is actuated for delivering the sand to the muller. A valve arrangement in the tank insures against over-accumulation of the medium and provides for recirculation of the medium from the tank to the dust collector when the medium level in the tank attains a preset maximum. (Author summary modified)

32215 **APTIC NO. 54799**

Connor, J. M., G. J. Dell, and D. J. Newman

POLLUTION CONTROL IN ACID PLANTS. *Chem. Age India, 23(2): 103- 116, Feb. 1972.*

Pollution control problems and processes are reviewed for plants engaged in the production of sulfuric acid, phosphoric acid, and nitric acid. Incomplete conversion of sulfur dioxide to sulfur trioxide is the fundamental difficulty for sulfuric acid-producing plants. The most successful approach to this problem on a commercial scale has thus far proven to be the Double Absorption process in which an intermediate absorption stage is incorporated between two of the catalyst stages. Fluorides released during rock digestion and acid concentration are the main problems in phosphoric acid production. These emissions can be minimized by use of properly designed scrubbers, and recovery can provide a valuable by-product. Most nitric acid plants discharge tail gas containing 1500 to 3000 ppm by volume of nitrogen oxides if no treatment is provided. Catalytic combustion is the only abatement method now in operation at nitric acid plants, and the difficulty experienced with combustor catalysts, as well as the still uncertain life of new ones offered, has led to renewed interest in other methods of minimizing nitrogen oxide emissions.

32216 **APTIC NO. 54309**

Crosta, David

POLLUTION PREVENTIVE BURNER SYSTEM. *(Assignee not given.) U. S. Pat. 3,660,006. 5p., May 2, 1972. 3 refs. (Appl. Dec. 14, 1970, 12 claims).*

A pollution preventative burner system for use with boilers and furnaces has been developed which includes a rotary cup burner having a combustion chamber and a means for igniting a fuel oil and air mixture discharged into the chamber by a rotary cup nozzle. The fuel oil is supplied to the burner under pressure, and its flow rate is controlled by an automatically operated valve to optimize the oil-air mixture supplied to the combustion chamber. The valve which is actuated by a modulating motor consists of a housing having inlet and outlet ports and a valve chamber having triangularly shaped openings communicating with the inlet and outlet ports. A valve member is rotatably disposed within the chamber and linked for movement to the modulating motor. The valve takes the form of a cylinder having a cutout portion which extends angularly to allow for a shearing action at the triangularly-shaped openings in the valve chamber. Hence, any sediment which may collect at the openings is dislodged, and an accurately controlled flow of oil is provided due to the adjustable position of the angular edge of the valve member with respect to the converging edges of the triangularly shaped chamber openings. (Author abstract modified)

32217 **APTIC NO. 54433**

Curran, G. P., W. E. Clark, Melvyn Pell, and Everett Gorin

LOW-SULFUR CHAR AS A CO-PRODUCT IN COAL GASIFICATION. *Consolidation Coal Co., Inc., Library, Pa., Research Div., Environmental Protection Agency Contract EHSC 71-15, Program Element 1A20113, EPA-R2-72-060, 65p., Oct. 1972. 14 refs.*

NTIS: PB 214162

A feasibility study is presented for the case where low-sulfur char is produced as a co-product with low-sulfur producer gas in a gasification-desulfurization operation with bituminous coal. Calcium carbonate is used as a S acceptor. Experimental data support the design feasibility study and show that pre-oxidized coals are extremely responsive to desulfurization under the conditions used. It is possible by this method to produce low sulfur chars containing 0.5% or less S content. The economic evaluation shows that it is possible to produce low-sulfur char at a lower Btu cost than would be the case for complete gasification to low-sulfur producer gas. The value of the char as a boiler fuel is less than that of the producer gas itself. Therefore, there is no clear incentive to produce low-sulfur char as a co-product in a gasification-desulfurization operation. (Author abstract modified)

32218 **APTIC NO. 55096**

Darby, K.

GAS CLEANING IN THE IRON AND STEEL INDUSTRY. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 241-254. 7 refs. (May 15-18.)*

A brief survey is made of cyclone or inertial collectors, bag filters, liquid scrubbers, and electrostatic precipitators, as they are normally employed in the iron and steel industry for the removal of suspended material from gases. The cyclone has the advantage of great simplicity and low capital cost. These devices are generally used for the coarser dusts since efficiency falls rapidly for particles below 10 micron. Bag filters usually offer better than 99% efficiency for particles down to 0.1 micron and below, though the nature of their material composition limits their use to low temperature operation. Pressure loss is one of the most important factors in determining the use of scrubbers for gas cleaning, particularly of fine fume. Those of the variable orifice design can maintain the same efficiency over a wide volume range. The gas discharge resulting from a scrubbing operation is fully saturated and relatively cool; hence a dense plume of vapor is created and may become a nuisance under certain climatic conditions. A positive feature of the scrubber, not normally used, is its ability to remove gaseous contaminants by dosing the scrubber water. The electrostatic precipitator has the highest capital cost, though this is balanced out against favorable operating costs. There is virtually no limit to the particle size which can be removed, and efficiency approaching nearly 100% may be attained. Efficiency follows an exponential law, and cost dictates that in practice the plant should be sized to give the minimum efficiency to satisfy requirements.

32219 **APTIC NO. 54354**

De Palma, Ted V.

VAPOR CONTROL SYSTEM FOR AN ENGINE TO ELIMINATE SMOG. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,665,906. 5p., May 30, 1972. 6 refs. (Appl. Dec. 29, 1969, 3 claims).*

An improved fuel evaporation control system for an internal combustion engine provides for a changing oil film or coating for use in combination with a vapor absorptive bed to improve the efficiency of the latter. The preferred form of the vapor absorption unit receives vented vapors from the carburetor as well as from the fuel tank. It also incorporates a circulating oil system that periodically delivers a fresh oil film or coating to the vapor absorbing bed; hence, a relatively high level of absorption efficiency is maintained in the absorber unit of the automobile. At least a portion of the engine oil is advantageously used to provide the oil film so that upon engine operation there will be a change of oil film and a means for effecting the removal of sorbed vapors from the oil stream within the crankcase of the engine. The absorber bed may be composed of particulate material such as spheres or pellets of carbon, alumina, silica, silica-alumina, etc., or it may comprise a porous fiberous media in the form of a mat, strands, particulates, or corrugated type. The bed may also make use of various plastic open-cell foam materials such as polyurethane, polyethylene, and polystyrene.

32220 **APTIC NO. 55156**

Dobson, Kenneth F.

THE TECHNICAL CAPACITY OF THE OIL INDUSTRY IN AUSTRALIA TO MEET AIR QUALITY STANDARDS. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 205-213. (May 15-18.)*

A review of the oil industry in Australia and its ability to meet air quality standards is presented. Processes presently incorporated in refineries to reduce pollutants are: gas treating units for hydrogen sulfide removal, catalytic desulfurizing units using a hydrogen-rich stream, alkaline process for acid smuts, properly designed incinerators and flares to burn waste hydrocarbon gases at an effective height, maximum economic recovery of waste heat, and closed systems for liquid effluents. The oil industry has generally made these improvements without compulsive legislation. The increasing use of Australian crude from the Gippsland fields (70%) as opposed to crudes imported from the Middle East which are higher in sulfur content has resulted in an automotive distillate sulfur reduction from 0.25% in 1960 to 0.15% currently. Several processes for desulfurizing sulfur dioxide-containing flue gases are in the trial stage, and removal of sulfur from residual fuel during its manufacture is a commercial practice of recent. Carbon monoxide emissions are dept to a minimum by good firing control and maintenance. Reduction of nitrogen oxides from combustion of furnace oils is now in the testing stage. Numerous studies have been made on the effect of lead removal from gasoline on exhaust hydrocarbon emissions from automobiles and resulting smog formation and have shown conflicting results. The industry generally sees a need for well-considered plans based on accepted and proven criteria followed by feasible standards recognizing technical ability to achieve them and their cost and time required.

32221 **APTIC NO. 54548**

Dragon, James W. and Alfred G. Ocken

EVAPORATION EMISSION CONTROL DEVICE FOR FUEL TANKS. *(Motorola, Inc., Franklin Park, Ill.) U. S. Pat. 3,662,725. 4p., May 16, 1972. 4 refs. (Appl. Aug. 26, 1970, 4 claims).*

An improved evaporation control valve for controlling the polluting hydrocarbon evaporation from an automobile fuel tank has been designed to open and close the conduit passageway from the fuel tank under certain selected conditions, as for example when the engine and fuel tank assume an angular attitude. The device consists of two spherical balls which float in a housing defining a cavity. The balls move up and down in accordance with the fuel level in the tank to allow the top ball to engage a conical seat for sealing the vented passageway from the fuel tank to the engine. The spherical contact surfaces between the two balls allow quick and easy movement of the top ball for sealing the opening when gasoline moves toward it. The vapor which the emission control device passes to the crankcase may be removed, together with oil vapor, by a standard control valve in the usual manner. (Author abstract modified)

32222 **APTIC NO. 54639**

Eguchi, Yoshitomo

PROCESS FOR REMOVING SULFUR OXIDES FROM WASTE GAS. *(Takeda Chemical Industries, Ltd., Osaka (Japan)) U. S. Pat. 3,667,910. 5p., June 6, 1972. 5 refs. (Appl. Aug. 27, 1969, 4 claims).*

An industrially feasible process for removing sulfur oxides from waste gases has been developed in which activated carbon, preferably vanadium oxide-supporting activated carbon, can be employed in almost inexhaustible repetition through cycles of sulfur oxide adsorption and activated carbon regeneration. The process consists of contacting the waste gas with vanadium oxide-supported activated carbon (0.001-0.1 parts by weight of vanadium pentoxide per part by weight of activated carbon) at a temperature lower than 200 C; activated carbons having a surface area between 600 and 1200 sq m/g are most advantageously employed. The sulfur oxides-adsorbing activated carbon is regenerated with a desorbent containing carbon monoxide gas and/or hydrogen gas in a concentration at least 40% and a temperature between 230 and 450 C. The adsorbed sulfur oxides are desorbed as sulfur dioxide which is recovered from the resulting gas mixture.

32223 **APTIC NO. 55091**

Eknayan, Hrant

APPARATUS AND METHOD FOR TREATING ENGINE EXHAUST PRODUCTS TO MINIMIZE HARMFUL CONSTITUENTS. *(Assignee not given.) U. S. Pat. 3,672,171. 5p., June 27, 1972. 11 refs. (Appl. Feb. 5, 1970, 16 claims).*

A light-weight, compact device which is installable in engine exhaust pipes has been designed for converting most if not all of the harmful exhaust constituents to substantially harmless forms. The initial stage of operation involves mixing of the nitrogen compounds in the exhaust with heated oxygen from the air entering the exhaust pipe. The stream then passes over small pellets of charcoal in the presence of copper, such as fine copper wire and copper powder, with the result that nitric oxide is converted to nitrogen dioxide. The exhaust products than pass through an afterburner maintained at a temperature in the range of 800 to 1200 F where further conversion of objectionable exhaust products occurs with the oxidation and combustion of unburned and incompletely burned hydrocarbons. The hot products then pass through the usual muffler and into contact with a body of water located in a baffled receptacle at the end of the exhaust pipe where absorption and solution of remaining traces of nitrogen-carrying constituents is effected along with the condensation of water and other vapors having similar dew points as water vapor. The residue harmless exhaust products are then expelled to the atmosphere.

32224 **APTIC NO. 54305**

Erythropel, H.

POWER PLANT ASHES - A VALUABLE CONSTRUCTION MATERIAL. *(Kraftwerksasche - ein wertvoller Braustoff). In: Jahrbuch der Dampferzeugungstechnik, Vulkan Verlag Dr. W. Classen, 2nd ed., Essen, West Germany, p. 1-11, 1972 (?). 9 refs. Translated from German, 17p.*

Bituminous and anthracite coal ashes in the Federal Republic of Germany are discussed and suggestions are made for their uses as building materials. It is estimated that 6.2 million tons of bituminous coal ashes and 6.5 million tons of hard coal ashes were produced in 1970. Ashes differ greatly depending upon the initial fuels and their mineral content, the type of combustion, and the mode of operation and the location of recovery. They may be classified as slags, fly ashes, or fly dust and as fuses ashes or granulates. Chemical analyses, particularly of bituminous coal ash vary greatly. They are characterized by strongly varying silica content (20-70% by weight), the different degrees of sand contaminations which depend on the origin of the coal, and high lime (10-45%) and sulfur oxide content (2-15%). The silica and alumina content of German anthracite coal ashes is approximately 80%. Ashes are particularly suitable for utilization if they are preprocessed in the power plants. Separators are used for both types of coal ash. In anthracite coal, the fly ash is separated into a fine low carbon and a coarse high carbon fraction. In bituminous sands are separated from lignite fly ashes. Boiler slags are processed in a sieve installation to a product with uniform grain size. Slag is suitable for road construction and as a filler material. Bituminous fly ashes are used as fillers and can be processed to a fertilizer for acid soil. Anthracite fly ashes are used mainly in the production of construction materials such as steam hardened gas cement and small bricks.

32225 **APTIC NO. 55006**

Evans, Marvin and David H. Miller

AFTERBURNER. *(College Research Corp., Milwaukee, Wis.) U. S. Pat. 3,658,482. 5p., April 25, 1972. 5 refs. (Appl. Sept. 8, 1970, 14 claims).*

An afterburner for incinerators, furnaces, and other burning units has been designed to provide complete combustion of the waste products in the exhaust gases. The device includes an outer closed refractory casing and an inner cylindrical refractory member to provide an outer annular chamber between the two. The upper end of the inner member is spaced from the top of the casing to establish communication between the outer annular chamber and the interior of the inner member. The exhaust gases from the incinerator or furnace are introduced tangentially into the lower end of the outer chamber and pass upwardly with a swirling motion to the upper chamber and then downwardly into the interior of the inner member. The gases are discharged from the inner member through a vertical stack assembly which is located centrally of the inner member. Fuel and air are introduced into the lower end of the outer chamber along with the exhaust gases for ignition and burning of the combustible products in the gases. The stack assembly includes an outer stack to provide an air passage between it and the inner stack, thus ensuring complete combustion. Air passing within the passage is heated and merges with the exhaust gases to provide a secondary stage of combustion. (Author abstract modified)

32226 **APTIC NO. 54712**

Fair, James R., Burton B. Crocker, and Harold R. Null

TRACE-QUANTITY ENGINEERING. *Chemical Engineering, 79(17):60-74, Aug. 7, 1972. 38 refs.*

The evaluation, separation, and attendant process-engineering considerations are presented for dealing with trace quantities of materials present in fluid diluents. Trace quantities of materials present in a plant-effluent stream whose effects have not been reported in the literature present the necessity of the producer running his own atmospheric and stream-effects tests. Immediate and long term effects must be considered as well as reaction possibilities with other trace materials present. Degradability, life-span, probability of entrances into food chains, must all be considered. Removal of trace quantities may be effected by such processes as gas absorption, liquid extraction, adsorption, ion exchange, membrane separation (reverse osmosis), foam fractionation, or a combination of such methods. Collection of small particles entrained in gases is often preceded by coagulation or nucleation to increase the particle size and facilitate collection. Filters, scrubbers, collectors, and electrostatic precipitators can be used. Chemical separations where the trace material is reacted with another material, usually in large excess, to form a product that can in turn be separated, are limited by the considerations of thermodynamic equilibrium, intrinsic reaction kinetics, and transport rates, which in turn are dependent on the reacting system, equipment geometry, and flow conditions. The usual considerations that prevail during the process design of trace quantity systems are: collecting the physical property data, scaling up the laboratory work, applying appropriate design models, selecting the materials of construction, providing for process control, and evaluating the general economics.

32227 **APTIC NO. 54692**

Fegan, Lloyd V., Jr. and James L. Sloughfy

METHOD FOR PRODUCING HIGHLY-FLUXED PELLETS CONTAINING OXIDES OF IRON FROM IN-PLANT WASTE PRODUCTS. *(Bethlehem Steel Corp.) U. S. Pat. 3,684,478. 4p., Aug. 15, 1972. 10 refs. (Appl. April 2, 1971, 7 claims).*

A process has been developed for producing highly-fluxed pellets containing iron oxides from in-plant wasty products which contain metallic iron, ferrous iron, iron in higher valence states, and carbon. A mix suitable for balling is formed from not more than about 35% metallic and ferrous iron waste products, not less than about 35% iron oxides, and nor more than 30% fluxstone, as for example dolomite; the carbon in the mix is not more than about 0.5%. Sufficient water is added for proper balling, the mix is balled, and the resulting green balls are dried at a temperature of 212-600 F. The dried balls are heated to 1000- 1200 F so that a substantial portion of the carbon is burned and oxidation of metallic and ferrous iron to a higher iron state occurs. The temperature of the dried balls is then raised to 2150-2350 F for hardening of the balls into pellets. Substantially all of the metallic and ferrous iron is oxidized to the higher valence states. This method produces less air pollution than previously used sintering operations. (Author abstract modified)

32228 **APTIC NO. 54763**

Feigin, S. A. and S. B. Kostyukovskaya

PRODUCTION OF BOILER FUEL OF LOW SULPHUR CONTENT AND MEANS OF PROVIDING TOWN HEAT AND POWER STATIONS WITH LOW-SULPHUR OIL. *Thermal Eng. (English translation from Russian of: Teploenergetika), 19(10):14-16, Oct. 1972.*

The pregasification of high-sulfur oils ensures a considerable and economical reduction in the amount of sulfur dioxide discharged by large power stations. It is necessary to produce and sell large quantities of chemical products on the basis of the utilization of sulfur-containing raw materials. Taking into consideration the relatively low capacity of Moscow heat and power stations and the prohibition of the construction of new chemical plants, it is advisable to organize the production of boiler fuels with a low S content at oil refineries. Engineering and economic analyses of different methods for the removal of S from boiler fuel at oil refineries indicated that the lowest costs are involved when the processes of hydrocleaning the distillate and thermal-content cracking are combined. To give greater incentives for oil refineries to produce, and for consumers to use, low S boiler fuels, it is advisable to review the prices of boiler fuels with different S concentrations. (Author summary)

32229 **APTIC NO. 54644**

Ferrara, Italo and Italo Castellani

CATALYTIC PROCESS FOR THE PURIFICATION OF GASES AND CATALYTIC COMPOSITIONS SUITABLE THEREFOR. *(Simcat-Societa Industriale Catanese S.p.A., Palermo (Italy)) U. S. Pat. 3,661,509. 3p., May 9, 1972. 1 ref. (Appl. June 20, 1969, 2 claims).*

A catalytic composition and process for the purification of gases contaminated with mercury offer the advantages of optimum mechanical resistance, nonsusceptibility to moisture, long life, and facile regeneration. The gas contaminated with mercury is brought into contact with a catalytic composition consisting mainly of mercuric sulfide and a small proportion of crystalline sulfur, as for example, 60-80 mg of mercuric sulfide and 5-10 mg sulfur/g of carrier at a temperature of 0-75 C, a pressure ranging from atmospheric to about 30 atm, and a space velocity of up to 10,000/hr. The catalytic composition is fixed on a suitable carrier such as active carbon or alumina which can be easily reactivated by charging with traces of sulfur. The composition is particularly suitable as a filter medium for gas masks.

32230 **APTIC NO. 54988**

Filatov, Sergei Sergeevich and Mikhail Maximovich Konorev

APPARATUS FOR THERMOCATALYTIC NEUTRALIZING OF EXHAUST GASES OF AN INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,669,630. 4p., June 13, 1972. 11 refs. (Appl. Feb. 12, 1970, 3 claims).*

An apparatus for the thermocatalytic neutralization of an internal combustion engine s exhaust gases has been developed such that the combustion products supplied by the burner device do not come into direct contact with the exhaust gases of the engine. The device consists of a housing with an inlet and outlet for exhaust gases, a separation chamber of the cyclone type situated within the housing and downstream of the inlet, a heat exchanger located within the housing and communicating with the separation chamber, and a burner device coupled to the heat exchanger. The heat exchanger includes conveyor tubes for the passage of exhaust so that heating of the exhaust gases is effected by the combustion gases indirectly through the tubes. A chamber containing a catalyst is located within the housing upstream of the outlet and communicates with the heat exchanger for receiving the exhaust from the heat exchanger and neutralizing the gases. An outlet conduit from the heat exchanger receives the combustion products of the burner and directs them to the atmosphere.

32231 **APTIC NO. 55007**

Firey, Joseph C.

ENGINE EXHAUST GAS SEPARATING DEVICES. *(Assignee not given.) U. S. Pat. 3,670,502. 3p., June 20, 1972. 7 refs. (Appl. March 6, 1970, 2 claims).*

An internal combustion engine exhaust gas separating device has been designed such that the exhaust gas is divided into two streams, one relatively hotter and richer in oxides of nitrogen, and the other relatively colder and richer in incompletely burned fuel components so that removal or reduction of these undersirable portions can be rendered more efficient and effective. The device consists of an exhaust valve, an exhaust valve linkage, and an intake valve linkage to direct the hotter, first flowing exhaust gas portions into a hotter gas manifold and the cooler, later flowing exhaust gas portions into a cooler gas manifold. A valve element is located in the engine exhaust manifold of each cylinder and is actuated by the intake valve linkage of that cylinder to connect the exhaust manifold of that cylinder to the hotter gas manifold by the opening action of the engine intake valve; the valve element is subsequently actuated by the exhaust valve linkage to connect the exhaust manifold of the particular cylinder to the cooler gas manifold. The ports of the valve have been proportioned so that the exhaust manifold is at all times connected either to the hotter gas manifold or the cooler gas manifold, or to both.

32232 **APTIC NO. 54267**

Foucher, Walter D., Jr. and Thomas W. Norman

CATALYST AND METHOD OF MAKING SAME. *(Texaco Inc., New York) U. S. Pat. 3,681,260. 3p., Aug. 1, 1972. 3 refs. (Appl. Dec. 26, 1968, 7 claims).*

A catalytic structure characterized by relatively high activity over long periods of use and composed of a catalyst support and an adherent catalytically active layer of a crystalline material having the compositional formula (CuO)x(Al2O3)y (nH2), where x is from one to three and y is from one to four, has been developed for application is such processes as the oxidation of olefins, incorporation into catalytic mufflers for the oxidation of exhaust gases, oxyhalogenation reactions the dehydrogenation of low molecular weight paraffins to olefins, the oxidation of carbon monoxide and hydrocarbons to carbon dioxide and water, and conversion of sulfur dioxide to sulfur trioxide in flue gases. The catalyst is prepared by contacting a support with a source of aluminum, a base, a source of copper, and an ammonical reagent, where the ammonia: copper ratio is at least four. The catalytically active layer has a thickness of from 1 to 100 mils and is contacted at a temperature of from 100 to 212 F for a period of from 3 to 72 hr; the coated support is calcined at a temperature of from 300 to 1000 F. The Cu:Al ratio should be from 1.5 to 5.0

32233 **APTIC NO. 54638**

Fraini, Edward A. and David E. Minter

PROCESS FOR REDUCING SULFUR IN HYDROCARBONS WITH METALLIC MAGNESIUM. *(Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,663,433. 2p., May 16, 1972. 2 refs. (Appl. Feb. 1. 1971, 7 claims).*

Desulfurization of crude hydrocarbon feedstock containing sulfur impurities in the form of organic mercaptans, organic sulfides, thiophenes, and the like can be achieved without expensive prior art catalysts by the use of finely divided magnesium under the proper conditions. The feedstock is reacted in a hydrogen atmosphere with 0.1-0.2 weight of finely divided magnesium per weight of feedstock at a temperature of 600-850 F and a pressure of 100-2000 psig. The magnesium has a particle size of less than 170 micron, and the hydrogen flow rate is 0.5-1.5 moles of hydrogen per mole of feedstock per hour. The treated feedstock containing magnesium sulfide is conducted to a liquid-liquid extractor and is contacted with a countercurrent flow of dilute hydrochloric acid (about 10% by weight) to generate hydrogen sulfide as the overhead gas, magnesium chloride as the residue, and the desired desulfurized feedstock. The H2S gas can be treated by known processes to recover sulfur as a by-product, and the MgCl2 can be treated by known electrolytic processes to regenerate finely divided magnesium which can then be recycled to the reactor.

32234 **APTIC NO. 54220**

Frevel, Ludo K. and Leonard J. Kressley

PROCESS FOR RECOVERING CARBON DIOXIDE FROM STACK GAS. *(The Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,660,023. 3p., May 2, 1972. 4 refs. (Appl. Feb. 2, 1970, 8 claims).*

A process for recovering carbon dioxide from stack gases resulting from the combustion of carbonaceous materials such as coke, coal, oil, and natural gas has been achieved by the use of solid sodium carbonate as the reactive agent; the sodium carbonate can be regenerated after the reaction to be useful in a cyclic system. The process involves contacting the stack gas with porous sodium carbonate having a high surface area, i.e., greater than 0.3 sq m/g at a temperature of 40-75 C. Interaction between moist carbon dioxide and sodium carbonate forms 3 sodium bicarbonate sodium carbonate which upon heating to a temperature of 150-250 C decomposes into CO2, water, and Na2CO3. The liberated CO2 is readily recovered and the regenerated NaCO3 can be used to recover additional CO2, thus permitting a cyclic process. (Author abstract modified)

32235 **APTIC NO. 54351**

Frundl, Ronald J., Victor W. Hanson, Robert M. Jamison, and Orlan M. Arnold

AFTERBURNERS FOR CUPOLA FURNACES. *(Ajem Laboratories, Inc., Livonia, Mich.) U. S. Pat. 3,666,248. 7p., May 30, 1972. 2 refs. (Appl. Sept. 11, 1970, 16 claims).*

A system for the more effective consumption of carbon monoxide and organic residues in furnace stacks has been developed in which the heat value of carbon monoxide within the cupola furnace is utilized before its escape up the stack to effect increased efficiency, enhancement of the metallurgical process, and reduced pollution. Several self-sustaining in-bed burner jets are arranged around the periphery of a furnace stack in positions below the charge door opening to direct the burner flame into the stack below the top surface of the charge bed. Supplementary air may also be supplied to the stack from positions adjacent the burners, and appropriate control means are provided to vary the direction and volume of air supplied in accordance with the character of combustion products present in various sectors of the furnace stack. The control means can be present for expected conditions, manually adjusted, or automatically responsive to sensors monitoring conditions within the stack. Oxygen may be used to augment or replace the supplementary air provided appropriate adjustment of the hydrocarbon gas and coke charge is performed to give the desired carbon content to the molten metal. The in-bed burners and supplementary air effect burnout of the CO in the exhaust stack gases and maintain a relatively high temperature in the top portions of the charged bed to thermally crack and burn the organic materials present in the charge.

32236 **APTIC NO. 54797**

Garnett, Alice and P. Read

NATURAL GAS AS A FACTOR IN AIR POLLUTION CONTROL. *Preprint, Inst. of Gas Engineers, London, England, 23 p., 1972. 7 refs. (Presented at the Institution of Gas Engineers, Annual General meeting, 109th, London, England, May 16-18, 1972, Paper 868.)*

An examination of the air pollution levels for the winter 1970/1971 in Sheffield, England showed a close relationship between decreases in sulfur dioxide and increases in the use of natural gas, consequent upon a changeover from fuels with a sulfur content of 0.9 to 3.5%. The maximum reductions in SO2 occurred in close proximity to these industrial areas where the maximum potential SO2 saving was located. The total theoretical SO2 emission saved by industry alone amounted to nearly 1600 tons. The reductions were not attributed to climatological influences, since weather analyses for the period warrented the occurrence of increases rather than decreases. Examination of the SO2 levels in the various urban functional areas must be further examined before firm conclusions can be drawn. (Author conclusions modified)

32237 **APTIC NO. 54308**

Giammarco, Giuseppe

GAS PURIFICATION PROCESS. *(Vetrocoke Cokapuania S.p.A., Venezia Porto Marghera (Italy)) U. S. Pat.*

3,659,401. 12p., May 2, 1972. 6 refs. (Appl. Oct. 13, 1969, 9 claims).

A gas purification process is presented in which an absorption liquid which is regenerated in a low pressure zone is taken from the pressurized absorption zone and expanded in an ejector to free the contained gaseous impurities. The passage of liquid through the ejector creates a sub-atmospheric pressure in an expansion zone of the regeneration zone communicating with the ejector, and the expanded liquid is introduced into a separating zone where at least part of the absorbed gaseous impurities are separated from the absorbent liquid. The partially regenerated absorbent liquid is then removed from the separating zone and introduced into the expansion zone to remove additional absorbed gaseous impurities in the absorbent liquid. The impurities are then drawn into the ejector and removed from the system. The substitution of an ejector for a vacuum pump in absorption and regeneration processes dealing with the removal of hydrogen sulfide from coking gas, for example, has the advantages of eliminating the power consumption of a pump and replacing the pump with a low-cost piece of equipment free from maintenance costs. Carbon dioxide and other cases can also be absorbed by this system.

32238 **APTIC NO. 54549**

Gladu, Norman D.

SMOKE CLARIFIER. *(Intercontinental Environmental Controls Ltd., Vancouver (British Columbia) U. S. Pat. 3,660,045. 9p., May 2, 1972. 4 refs. (Appl. Feb. 20, 1970, 11 claims).*

A water spray smoke clarifier which can be installed on the upper end of a conventional smokestack has been designed to remove a maximum amount of particulate material from the smoke while minimizing the back pressure created by such clarifying action. Operationally, projection of the smoke flowing upward through the stack into the downwardly opening conical baffle of the apparatus tends to precipitate particulate matter, principally fly ash, from the smoke. The smoke then billows around the rim of the conical baffle outward and upward into a washing zone. Passage of the smoke around the lip of the baffle creates turbulence which further tends to precipitate particulate matter from the gaseous component of the smoke. The smoke passes first through a curtain of downwardly directed water sprays and then through a curtain of radially directed sprays which entrain the particulate matter from the smoke and carry it outward to drain sheets. The particulate-laden water flows downward along the walls of the washing zone to an annular drain duct of the clarifier skirt. A drain pipe extends in a downward direction from the bottom wall of the annular drain duct for removing the contaminated spray water. One or more cleanout openings may be provided in the lower portion of the skirt through which any accumulations of particulate matter can be removed from the lower portion of the drain duct.

32239 **APTIC NO. 54830**

Gleim, William K.

SLURRY PROCESS FOR HYDROCARBONACEOUS BLACK OIL CONVERSION. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,657,111. 4p., April 18, 1972. 3 refs. (Appl. Feb. 24, 1970, 7 claims).*

An efficient and economical slurry-type catalytic process for the conversion or hydrorefining of heavy hydrocarbonaceous material containing insoluble asphaltenes into hydrocarbon-soluble products has been developed which simultaneously effects a substantial degree of hydrorefining and reduces the concentration of sulfurous and nitrogenous compounds. The fresh feed charge stock is admixed with 1.0 to 25% by weight of an oxovanadate salt having the following structural formula: $(N(R)4)3VO(X)5$, where X is a cyano, or thiocyano radical and R is hydrogen or an alkyl group containing up to about 10 carbon atoms. The resulting mixture is reacted with hydrogen and hydrogen sulfide to produce the catalytic vanadium sulfide in situ within the reaction zone. The inlet temperature is generally controlled at a minimum level of about 225 C and at higher levels such that the outlet temperature does not exceed about 500 C. Excellent results are generally attainable when the temperature gradient across the reaction chamber is about 380 to 450 C. The reaction zone is maintained under an imposed pressure greater than 500 psig and preferably from 1500 to 5000 psig.

32240 **APTIC NO. 54996**

Gramer, Gottfried

GAS PURIFYING APPARATUS. *(Siemens A. G., Munich (West Germany)) U. S. Pat. 3,658,485. 5p., April 25, 1972. 5 refs. (Appl. April 22, 1969, 7 claims).*

An oxidation-reduction apparatus for purifying contaminated nuclear reactor coolant gas of nuclear decomposition products in a closed coolant loop of the reactor has been designed in which the gas to be purified is led at a temperature of about 150 to 800 C over a filter bed of copper and copper oxide bearing particles while oxygen, carbon monoxide, or hydrogen gas, and their mixtures are supplied during the processing period for regenerating the filter. The purification apparatus consists of a single filter bed of the above-mentioned particles which is disposed in a constant-temperature container. The filter particles advantageously consist of porous sintered bodies which have a very large effective outer surface. This filter bed construction insures a large capacity, mechanical stability, and the use of the bed under very high pressures. Regeneration of the filter bed occurs during the gas purifying process to allow for great operational safety, constant availability, and minimal servicing cost. The apparatus is not only suitable for recombination of carbon monoxide and the removal of oxygen but also for recombination of gas such as hydrogen and oxygen which are formed by radiolysis.

32241 **APTIC NO. 54875**

Grayson, Herbert G. and Edwin F. Miller

FUEL SUPPLY SYSTEM FOR REDUCED EXHAUST EMISSION. *(Mobile Oil Corp.) U. S. Pat. 3,688,755. 7p., Sept. 5, 1972. 5 refs. (Appl. April 5, 1971, 10 claims).*

A modified fuel induction system is described which reduces the exhaust emissions from the internal combustion engines of automotive vehicles. The light ends of regular motor fuel are separated by flash distillation and stored in the vehicle; they are later supplied to the cylinders during low temperature operating conditions. The cut point for the separated light ends is automatically adjusted in response to the ambient temperature; this provides for the supply of fuel of greater volatility during cold starts under conditions of lower climatic temperature. Automatic control sensitive to the engine temperature is also present during the supply of the more volatile fuel to the cylinders. Conventional operation on full range fuel is automatically established at engine temperatures close to the normal operating temperatures; under these conditions, unburned hydrocarbon and carbon monoxide emissions are low. The evaporation of the light ends to provide a volatile fuel component may be induced by reduced pressure or by heating the full range fuel via the engine coolant exhaust heat, or electric heating elements. The volatile fuel component may be stored as a liquid condensate, absorbate or a solid absorbent, or the like. Alternatively, a chromatographic separation technique may be utilized. (Author abstract modified)

32242 **APTIC NO. 55037**

Hammond, Gary L.

SIMPLIFIED SUPERCHARGED INTERNAL COMBUSTION ENGINE WITH EMISSIONS CONTROL. *(Assignee not given.) U. S. Pat. 3,672,172. 6p., June 27, 1972. 7 refs. (Appl. March 15, 1971, 10 claims).*

A simplified low cost supercharged reciprocating internal combustion engine which provides for efficient combined supercharging and emission control as opposed to prior art devices has been designed for incorporation of the crankcase into the induction system by means of an air reservoir and multiple valves. The engine includes a sealed crankcase and a one-way valve in fluid communication with the crankcase, disposed so that external air is induced into the crankcase upon movement of the piston in one direction. An air reservoir is provided in fluid communication with the crankcase and a second one-way valve is disposed between the crankcase and the air reservoir so that air in the crankcase is forced into the reservoir upon movement of the piston in the reverse direction. The net effect is a positive displacement supercharger. Passageways are provided for introducing the resulting pressurized air into the cylinder and separately into the exhaust for afterburning purposes and a pressure regulator proportions the airflows. The pressurized air also pressurizes the fuel tank and thus the fuel supply to the engine. In a particular embodiment, a lubricating oil reservoir is provided adjacent the air reservoir with an air-oil separator means. (Author abstract modified)

32243 **APTIC NO. 54219**

Harding, Charles I., Lamar V. Russell, and W. Malcolm Steeves

GASEOUS OXIDE RECOVERY. *(Assignee not given.) U. S. Pat. 3,660,040. 7p., May 2, 1972. 12 refs. (Appl. April 10, 1969, 11 claims).*

A method for the reduction and recovery of sulfur dioxide and nitrogen oxides from flue gases has been developed based on the recovery of sulfur as sulfur oxides or sulfites and nitrogen as soluble nitrate, both of which may be sold or used to offset the cost of recovery. Sulfur dioxide is absorbed in a scrubbing liquor and concentrated in an ion exchanger as sulfite and/or bisulfite. The sulfite and/or bisulfite products are then removed in a resin regeneration liquor which is heated either directly from the ion exchanger or after it has been used as a second scrubber liquor. The bulk of the nitrogen oxides are sorbed in a scavenging resin bed receiving gas from the last scrubber in the series. Sulfur dioxide that escapes the scrubbers is also sorbed in the resin bed. The resin in this bed is mixed with and regenerated with the resin in the ion exchanger. The SO2 recovery means is preferably a cooling, drying, and compressing apparatus for producing liquid SO2.

32244 **APTIC NO. 55078**

Hart, J. A.

THE VORTEX PRECIPITATOR. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 107-113. 9 refs. (May 15-18.)*

The theory of sink-vortex potential flow as applied to particle/gas systems is used to evaluated one possible form of cyclone-type devices known as the vortex precipitator. The separating efficiency of conventional centrifugal dust collectors is suggested to be limited by the typically turbulent flow through them, whereas the efficiency of a vortex precipitator ought to approximate that calculated for the proposed ideal flow. Fluid velocities of about 100 ft/sec are required to effect a 95% fly-ash recovery in a 20 ft long and 9 ft diameter cylindrical vortex precipitator handling about 100,000 cfm of power station stack gases; about 200 ft/sec is required to effect a 99.3% recovery. Some possible combinations of vortex precipitation with other mechanical or electrostatic precipitators are also mentioned. (Author abstract)

32245 **APTIC NO. 54266**

Harvey, Kelsey I.

CERAMIC PRODUCT FROM FLY ASH AND METHOD OF MAKING SAME. *(Assignee not given.) U. S. Pat. 3,679,441. 3p., July 25, 1972. 8 refs. (Appl. Oct. 1, 1970, 3 claims).*

A process for producing ceramic articles from waste byproducts resultant from the burning of coal at power and industrial plants has been developed to eliminate the necessity of any binder or matrix in combination with the fly ash. The ceramic product is essentially 100% fly ash since only a temporary plasticizer such as Carbopol is utilized to hold the nonfired fly ash in desired molded configuration until complete burn-off during firing. The body to be molded consists of at least 90% carbon-free fly ash, water, and the organic plasticizer mixable with water. The process involves forming the fly ash into a moldable mix, forming the mix to a desired shape, drying the mix from the inside out in at least a 50% humid atmosphere, and firing the dried mix at a temperature of 1900 to 2300 F for 6 to 18 hr to provide interfacial fusion between contact points of adjacent fly ash particles.

32246 **APTIC NO. 54984**

Hayes, John C.

IN SITU REGENERATION AND RESULFIDING OF A PLATINUM- AND SULFUR- CONTAINING CATALYST IN A HYDROCARBON CONVERSION PLANT CONTAINING METALLIC SULFIDE SCALE. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,660,308. 6p., May 2, 1972. 8 refs. (Appl. March 12, 1970, 8 claims).*

A method for in situ regeneration and simultaneous resulfiding of a deactivated hydrocarbon conversion catalyst consisting of a platinum group component, a halogen component, and a sulfur component with a porous carrier material has been developed which consists of the following steps: stripping sulfur from the catalyst with a hydrogen stream at a temperature of 600 to 800 F in order to remove sulfur from the catalyst while not substantially affecting the metallic sulfide scale; purging hydrogen from the hydrocarbon conversion plant; burning carbon from the catalyst at relatively low severity conditions, including an inlet temperature of 650 to 850 F; purging oxygen from the plant; circulating a sulfur-free hydrogen stream through the plant and into contact with the resulting oxidized catalyst at a temperature of 600 to 800 F, selected to reduce the resulting oxidized catalyst without reducing the metallic sulfide scale; increasing the temperature of the circulating hydrogen stream to a range of 1000 to 1100 F to reduce at least a part of the metallic sulfide scale to hydrogen sulfide; and continuing the circulation of the resulting stream for at least one hour, thereby resulfiding the catalyst. (Author abstract modified)

32247 **APTIC NO. 54983**

Herbsman, Abraham M.

BORON TRIFLUORIDE ETHERATE-AMINE REACTION PRODUCTS. *(Assignee not given.) U. S. Pat. 3,642,901. 7p., Feb. 15, 1972. 2 refs. (Appl. July 31, 1969, 4 claims).*

A catalytic gasoline additive has been developed which is capable of providing catalytic polymerization and condensation of untreated auto exhaust gas components such as unsaturated hydrocarbons, oxides of nitrogen, and aldehydic, ketonic, and organic acid type compounds and which is freely soluble in fuel or gasoline and readily vaporized to provide a material decrease in the oxides of nitrogen content and the smog-forming reactivity of the exhaust gases. Engine blowby gases, emitted from the crankcase, may also be treated by leading and permitting such gases to intermingle with the catalyst contained in the catalyzed engine exhaust. The catalytic composition consists of the product produced by reacting boron trifluoride ethyl ether complex with an amine reagent selected from the group consisting of tertiary nonyl amine, a mixture of tertiary alkyl primary amines, ranging from t-C12H25NH2 to t-C15H31NH2, a mixture of tertiary-alkyl primary amines, ranging from t-C18H37NH2 to t-C24H49NH2, and primary alkyl aryl amines in which the alkyl radical is large enough to impart solubility to the reaction product in gasoline and liquid aliphatic hydrocarbons. (Author abstract modified)

32248 **APTIC NO. 54691**

Hewitt, Daniel B.

INCINERATION APPARATUS. *(Assignee not given.) U. S. Pat. 3,682,599. 4p., Aug. 8, 1972. 3 refs. (Appl. Aug. 20, 1970, 7 claims).*

An incineration apparatus for the secondary combustion of impurities found in flue gases such as fly ash, unburned coal particles, sulfur dioxide, and the like has been designed to complete combustion and thereby reduce exhaust pollutants. The flue gases are collected in an entrance portion of a flue member which concentrates and discharges the gases into an upper portion of the combustion chamber where the gases are in turn subjected to a concentrated high temperature flame. The combustion chamber is shaped to direct and concentrate flames into a neck portion for high temperature and for prolonged, intimate contact between the flame and unburned contaminants. The neck portion, positioned above the upper end of the flue member, has its flame zone completely occupying the exit flow path of the flue gases to effectively inhibit the emission of smoke, fumes, or other smog-producing contaminants from the incineration apparatus.

32249 **APTIC NO. 54906**

Honsberg, Wolfgang

ABSORPTION AND HYDROLYSIS OF CARBON OXYSULFIDE. *(E. I. du Pont de Nemours and Co., Wilmington, Del.) U. S. Pat. 3,660,017. 3p., May 2, 1972. 3 refs. (Appl. April 28, 1969, 8 claims).*

A process for the absorption and hydrolysis of carbon oxysulfide (carbonyl sulfide), a toxic gas which is present in some petroleum fractions, has been developed in which the contacting agent, other than the water portion, does not become consumed. The gas can be readily hydrolyzed by contacting it at a temperature above 100 C with water in the presence of an N-substituted alkanolamine or ether of the formula: $R\text{-}NH(CH_2)_n\text{-}OR_1$, where R is a saturated alkyl or cycloalkyl radical of 1 to 20 carbon atoms, R_1 is hydrogen or a saturated alkyl radical of 1 to 4 carbon atoms, and n is an integer of 2 to 4. The upper temperature limit of the reaction is the boiling point of each particular N-substituted alkanolamine at the reaction pressure. Either atmospheric or superatmospheric pressure can be used, but it is not worthwhile to operate at pressures exceeding about 200 psig. The amount of water injected into the system for hydrolysis is kept on the level required by the stoichiometry of the reaction; it is therefore necessary to know the concentration of COS in the inlet gases. The effectiveness of hydrolysis depends on the particular N-substituted alkanolamine used, the reaction temperature, the feed rate, and the residence time. The N-substituted alkanolamine has the dual function as an absorber for COS and as a participant in the hydrolysis reaction and is not consumed in the process.

32250 **APTIC NO. 54265**

Ito, Akio

METHOD AND APPARATUS FOR INCREASING OUTPUT OF CAR ENGINE AND PURIFYING EXHAUST GAS. *(Assignee not given.) U. S. Pat. 3,678,908. 5p., July 25, 1972. 3 refs. (Appl. March 19, 1970, 5 claims).*

A method and apparatus for expediting the mixing of volatile oil and air in an internal combustion engine has been developed to enhance combustion efficiency and to achieve maximum purification of exhaust gas, irrespective of the composition of fuel fed. Secondary air is supplied in suitable amount through a pipe halfway between the carburetor and manifold. A weak radioactive material such as a natural radioactive ore is provided at the inlet of the air pipe for the purpose of causing ionization of the fuel s hydrocarbon constituents, thereby resulting in marked enhancement of combustion efficiency. The natural radioactive ore may be of the alpha-ray, beta-ray, or gamma-ray type and is preferably of the uranium series, radium series, or tritium series. Results of practical tests of the present invention on trial cars showed more than a 10% increase in output and a reduction of carbon monoxide content from the conventional 3 to 6% level to as low as 0.1 to 0.3% level.

32251 **APTIC NO. 54614**

Jasinsky, Victor and Ambrose T. Upfold

FLARE STACK. *(Polymer Corp. Ltd.) U. S. Pat. 3,667,408. 4p., June 6, 1972. 3 refs. (Appl. Aug. 4, 1970, 7 claims).*

An apparatus for automatically controlling the temperature of a flare, and hence reducing or eliminating the smoke pollution from the flare stack, is presented. The device consists of a steam line leading to the flare, a flow control means in the steam line, a sensing element in the vicinity of the flare for producing a signal proportional to the flare temperature, and a transducer between the flow control means and the sensing element for converting the signal to a force acting on the flow control. One or more thermocouples connected in parallel are used to sense the temperature of the flare, and the signal produced directly or indirectly activates a steam control valve to adjust the flow of steam to the tip of the flare stack, thus raising or lowering the flare temperature to that required for optimum combustion of the stack effluent. Steam supply will be automatically controlled, thus eliminating the inadequacies of manual operation.

32252 **APTIC NO. 54346**

Johnson, Harry B.

ROOFING FACTORY FUME AND SOLID WASTE DISPOSAL SYSTEM. *(GAF Corp., New York) U. S. Pat. 3,662,695. 4p., May 16, 1972. 5 refs. (Appl. Aug. 18, 1970, 5 claims).*

A system for the ecological incineration of roofing material wastes such as combustible solids, saturator exhaust fumes, and oxidizants has been developed in which the wastes are at least partially used to fuel the incinerators. The solid wastes are sent to an attrition mill, fed to a surge bin, and then used as fuel in a solid waste and fume incinerator which also receives and ecologically incinerates the exhaust fumes from a saturator. A fume incinerator also receives saturator exhaust fumes along with effluent gas from the oxidizer of the factory and ecologically incinerates these components with a minimum consumption of conventional fuel. Fume ducts from saturator exhausts to the incinerators include a cross duct and switching valves for selectively controlling the flow of the saturator exhaust fumes from one or both saturators to one or both incinerators for optimum operational efficiency of the system. Granules resulting from the solid scrap incineration are washed and recovered for re-use. The resulting effluents from the process are suitably purified for exhaust to the atmosphere by virtue of the complete combustion achieved. (Author abstract modified)

32253 **APTIC NO. 55040**

Johnstone, Edward T., Robert S. Brunton, and Walter J. Cole

LOW COST FUME SUPPRESSION WITH AN OXYGEN FUEL BURNER AND LOW ENERGY SCRUBBER FOR STEELMAKING. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 261-267. 21 refs. (May 15-18.)*

A fumeless decarburization process which is specifically designed to replace the conventional oxygen hand lancing process in steel making has been developed by The Commonwealth Industrial Gases Ltd. to meet Clean Air Legislation. Tests at steelmaking works have indicated that decarburization and oxidation of dissolved metalloids occur without the formation of the familiar brown-red fume associated with oxygen addition when a highly oxidizing oxygen-fuel flame is jetted onto a liquid steel bath. The particle concentration was substantially depressed in comparison with similar oxidizing rates in conventional processes, and the particles themselves were agglomerated and chemically modified to magnetite with an average particle size of 1 micron. A simple low energy scrubber is effective when further treatment is required to reduce the effluent loading to lower levels for the complete steelmaking period because the oxygen-fuel burner jet modifies the emission. The main disadvantage of the process is an increase in refractory wear within the furnace confines. (Author abstract modified)

32254 **APTIC NO. 54683**

Kamino, Yasumi, Shigenori Onitsuka, and Kenji Yasuda

A STUDY ON DESULPHURIZATION OF FLUE GASES BY THE ACTIVE CARBON PROCESS USING STEAM DESORPTION (PART 1) - DESORPTION OF SULPHUR DIOXIDE FROM ACTIVE CARBON. *Bull. Japan Petrol. Inst., 14(1):1-6, May 1972. 4 refs.*

The desorption of sulfur dioxide from active carbon was investigated as one aspect of the studies concerning desulfurization of flue gases by active carbon. The adsorption of SO_2 into the active carbon from flue gases at 100-150 C is an adsorption involving chemical reactions, and the SO_2 changes into sulfuric acid on the active carbon. The desorption rate of SO_2 by thermal desorption is affected greatly by the temperature. The desorption reaction begins gradually at 200 C and the rate increases rapidly at 300 C. Sulfur dioxide and carbon dioxide are formed during the desorption and adsorbed water is eliminated at the same time. The molar ratio of the CO_2 to the SO_2 is fixed by the temperature of desorption regardless of the quantity of SO_2 absorbed, and it is less than 0.5 when the temperature is under 750 C. The desorption reaction with superheated steam is a 1.5-order reaction, and the energy of activation is 7.98 kcal/mol. (Author abstract modified)

32255 **APTIC NO. 54989**

Karnemaat, John N.

PROCESS FOR TREATING WASTE MATERIALS. *(Assignee not given.) U. S. Pat. 3,655,395. 5p., April 11, 1972. 5 refs. (Appl. Jan. 10, 1969, 6 claims).*

A process for treating industrial and municipal waste materials such as sewage, paper mill wastes, fermentation wastes, and the like containing about 10 to 70% by weight of suspended and/or dissolved solids and the balance of water has been developed to stop the bacterial action in such wastes, thereby reducing odor, and to economically recover solid materials such that they can be easily converted to various commercially valuable products. The process consists of mixing the waste materials with formaldehyde to kill the bacteria and to allow the reducing properties of the formaldehyde to react with materials in the waste, cautiously adding concentrated nitric acid and mixing same with the waste materials and formaldehyde in order to form a substantially homogeneous mixture while allowing time for the reduction of nitric acid into fuming nitric and for the oxidizing properties of the volatile nitrogen dioxide and other oxides to react with the materials in the waste, and then adding urea to the homogeneous mixture. A period of agglomeration then occurs, and the waste materials are precipitated or agglomerated into a form in which they can be treated in any one of numerous manners.

32256 **APTIC NO. 54498**

Karolidis, Charalampos Alexandros

COMBINATION AFTERBURNER AND AUXILIARY MUFFLER. *(Assignee not given.) U. S. Pat. 3,661,529. 6p., May 9, 1972. 11 refs. (Appl. July 6, 1970, 6 claims).*

A combination afterburner and auxiliary muffler has been designed to effectively destroy noxious exhaust gases emitted from the engine of an automobile, while acting as an auxiliary muffler. The device consists of a tubular casing with a lining of refractory material defining a passage for the mixture of exhaust gases and compressed air. An electrical heating unit and a heat sink unit are mounted in the passage, and baffles are situated intermediate to the heating unit and heat sink to deflect the gases from a straight line path to that of the letter S, i.e., a reverse curve. The heater is provided with a body of refractory material affording a restricted passage for the mixture of gases, and the electrical resistance heating elements are disposed within this restricted passage. (Author abstract modified)

32257 **APTIC NO. 54980**

Kester, Frank L.

CARBON DIOXIDE REMOVAL FROM BREATHABLE ATMOSPHERES. *(United Aircraft Corp., East Hartford, Conn.) U. S. Pat. 3,659,400. 5p., May 2, 1972. 4 refs. (Appl. July 21, 1970, 1 claim).*

A simple, reliable method has been developed for selectively separating carbon dioxide from the non-contaminating components of a breathable airstream in an efficient manner. The method consists of circulating the breathable gas containing carbon dioxide through a porous bed of finely divided particles of polymerized divinylbenzene coated with polyethylenimine, which adsorbs CO_2 in the bed at a temperature of 50 to 100 F while concomitantly desorbing and sorbing water vapor, if present in the CO_2 adsorption cycle. It periodically isolates the bed from the breathable gas stream, selectively desorbing the CO_2 from the bed at a pressure of 1 to 3 psia and a temperature not exceeding about 200 F, and subsequently reconnecting the bed to the breathable gas stream for further CO_2 removal. The CO_2 may be sorbed in either a wet or dry bed or from a humid or dry gas stream, thus eliminating the need for prior ancillary moisture control equipment. The CO_2 removal from a humid gas stream is selective with little or no water loss.

32258 **APTIC NO. 55092**

Klingman, Gilbert E. and Robert P. Schaaf

MAKE SNG FROM COAL? Hydrocarbon Process., 51(4):97-101, April 1972. 21 refs.

A review of the problems, prospects, and processes associated with the conversion of coal to substitute natural gas (SNG) is presented. One process, Lurgi s Pressure Coal Gasification method, is already commercially producing low Btu gas (500 Btu/scf), though the methanation step has yet to be proven. Four other processes which have reached the pilot plant stage are: the Bi-Gas process of Bituminous Coal Research, Consolidation Coal s Carbon Dioxide Acceptor process, the Hygas process of the Institute of Gas Technology, and the Synthane process developed by the U. S. Bureau of Mines. The primary goal of such processes is a reaction system which minimizes the amount of gas made in the methanation reactor; in the case of the Hygas process, 2/3 of the methane is produced in the gasifier reactor, while 59% holds for the Synthane process. A significant cost with each process is associated with the production of hydrogen which enters as steam. The energy removed in the product is 30 to 40% less than in coal feed because of the carbon loss and process heat requirements. The means of supplying heat for the endothermic steam-carbon reaction for hydrogen production is an important feature of each process. Capital investment required for the conversion of coal to pipe line gas (or liquid fuels) will be high regardless of which process is used. Operation of each of the processes is described.

32259 **APTIC NO. 55027**

Koberstein, Edgar and Eduard Lakatos

CATALYST FOR PURIFICATION OF EXHAUST GASES FROM MOTOR VEHICLES AND INDUSTRIAL PLANTS. *(Deutsche Gold-und Selber-Scheideanstalt Vormats Roessler, Frankfurt (West Germany)) U. S. Pat. 3,669,906. 5p., June 13, 1972. 5 refs. (Appl. Aug. 19, 1970, 19 claims).*

A catalyst capable of oxidizing various organic compounds including carbon monoxide and removing nitrogen oxides in contact with air has been developed for the purification of industrial and vehicular exhaust gases. The catalyst consists of a calcined mixture of eta and gamma aluminum oxide, heavy metal oxide compounds containing the element chromium, and at least one other heavy metal selected from nickel or copper with nickel. The quantity of the heavy metal oxide compounds amounts to 55 to 90% by weight; the molar proportion of chromium to the other heavy metal is between 1:0.5 and 1:2.5, calculated as oxides; and the majority of the particles of the heavy metal oxide compounds are from 0.5 to 5 micron in size. The heavy metal oxide compounds are formed by precipitation from a solution of ammonium bichromate with a soluble salt of the other heavy metal or metals, and the calcining of the mixture is performed at 400 to 800 C in an oxygen-containing atmosphere. (Author abstract modified)

32260 **APTIC NO. 54577**

Koenecke, William J.

ADJUSTABLE CYCLONE SEPARATOR. *(Metal Improvement Co., Inc.) U. S. Pat. 3,667,196. 6p., June 6, 1972. 6 refs. (Appl. Sept. 1, 1970, 7 claims).*

A cyclone separator has been designed to provide adjustment for optimum recovery of entrained solids of a desired mass from a gaseous fluid stream under a wide range of mass characteristics of the entrained solids. The essential difference between the present device and similar prior art units is the incorporation of a bypass gate or valve for controlling the flow area of a bypass opening in the wall of a hollow core within the unit s housing; the bypass opening communicates the separation chamber with the gaseous fluid outlet passageway. The adjustment of the bypass valve relative to the mass characteristic of the mixture of solid particles entrained in the gaseous fluid stream bypasses at least a portion of the gaseous fluid stream which contains particles below a selected minimum mass so that all of the separated solids collected in the collection chamber are of the desired mass values. The apparatus may also include a means for rotatively supporting and adjusting the core relative to the shell to thereby position the by-pass valve in the separation chamber. The core adjustment coacts with the bypass adjustment to provide a more precise separation of desired mass particles from the gaseous fluid stream. (Author summary modified)

32261 **APTIC NO. 54311**

Kubasta, James W.

OFFSHORE GAS FLARE APPARATUS. *(Shell Oil Co., New York) U. S. Pat. 3,666,395. 5p., May 30, 1972. 2 refs. (Appl. July 29, 1970, 5 claims).*

An apparatus has been designed for conducting waste gas produced from an offshore well extending into the floor of a body of water to a remote location. The apparatus consists of a platform structure which rests on the water floor and a gas line leading from the well to a remote location. A gas flare pipe is buoyantly supported in a vertical position at the remote location and is in fluid communication with the gas line. The support for the pipe includes a relatively short spar buoy anchored to the floor of the body of water through an elongated flexible cable pivotally attached thereto. Hence, waste gas from the well may be burned off (or vented to the atmosphere) while the support allows for movement of the gas flare pipe with water motion. (Author abstract modified)

32262 **APTIC NO. 54979**

Lasky, Jack S. and Ronald W. Fuest

PROCESS FOR REMOVAL OF ACIDIC MATERIALS FROM FLUIDS. *(Dept. of Health, Education and Welfare) U. S. Pat. 3,646,594. 6p., Feb. 29, 1972. 8 refs. (Appl. June 11, 1969, 29 claims).*

A blend of a polymeric amine-containing material and a melt-spinnable fiber-forming resin which may optionally contain a homopolymer of ethylene glycol, a derivative thereof, or a copolymer of ethylene glycol has been found to be effective in removing acidic materials such as sulfur dioxide from waste gases. The fibers produced from the blend are capable of being regenerated either by thermal or chemical means to restore their sorptive capacity. The material blend is prepared from a matrix polymer selected from a polyolefin, a polyester, and a polyamide in admixture with between 5 to 65% by weight of a thermally stable polymer containing 1 to 30% basic nitrogen which is conspinnable and dispersible in the matrix polymer. The basic nitrogen-containing polymer has a low vapor pressure, is only slightly soluble in water, and is selected from the following group of materials: thermoplastic homopolymers of vinyl substituted monocyclic and polycyclic pyridine compounds, condensation polymers containing tertiary amino groups pendant from the polymer chain, condensation polymers containing tertiary amino groups as an integral part of the polymer chain, and addition homopolymers and copolymers having pendant amino groups.

32263 **APTIC NO. 54985**

Lefrancois, Philip A. and Kenneth M. Barclay

PURIFICATION OF WASTE GASES. *(Pullman Inc., Chicago, Ill.) U. S. Pat. 3,671,185. 6p., June 20, 1972. 7 refs. (Appl. Aug. 12, 1968, 17 claims).*

A continuous and regenerative absorption process for the purification of industrial off-gases such as hydrogen sulfide, oxides of sulfur and nitrogen, carbon monoxide, and fly ash has been developed which provides for the recovery of components removed from the gases and which permits the use of a feedstock high in sulfur. The gas to be purified is contacted with a melt consisting of a metal carbonate of sodium, potassium, lithium, or mixtures thereof at a temperature between 1500 and 2000 F under a pressure drop not exceeding 1.5 lbs/sq in. in order to effect absorption of contaminant in the melt and to prevent the formation or accumulation of any substantial amount of sulfite in the melt. The decontaminated gas is cooled and vented to the atmosphere. The preferred method of contacting the contaminated gases with the carbonate melt consists of impinging the gas on the surface of the melt which is contained on one or more trays employed in series. The carbonate melt is continuously withdrawn and recycled to the contacting zone with a portion being removed for regeneration and a like portion of fresh carbonated feed being added to the recycle stream to supplement the amount of carbonate passed to regeneration.

32264 **APTIC NO. 54369**

Lirette, Odrey J.

POLLUTION CONTROL AND COOLING DEVICE FOR EXHAUST SYSTEMS. *(Assignee not given.) U. S. Pat. 3,664,135. 5p., May 23, 1972. 7 refs. (Appl. Sept. 14, 1970, 4 claims).*

A pollution control and cooling device for engine exhaust systems has been developed in which divergent sprays of water are dispersed throughout the cross-section of the exhaust pipe. Water is fed from a pump to a cooling system lead-in pipe inserted immediately after the manifold at the entrance to the exhaust line. The lead-in pipe feeds water via an inlet orifice to the inner chamber, and the water is then sprayed through holes throughout the entire exhaust pipe inlet cross-section. The main spray makes a 30 deg angle with the plane of its wafer structure interposed between and in line with the manifold and the exhaust pipe, and additional interspersed spray holes which make a 60 deg angle with the plane of the wafer body supplement the main spray to obtain a crossing and divergent spray pattern and to insure full coverage of the exhaust inlet. The main spray holes are off-set to the side, rather than radial, at an angle of 15 deg from the plane intersecting at 90 deg the plane of the wafer body to further insure the intermixing and full coverage desired. The exhaust fumes are thus immediately cooled to the point where no material air pollution presents itself at the exhaust exit.

32265 **APTIC NO. 54690**

Loudenslager, Ray D.

AUXILIARY AIR FUEL MIXTURE CONTROL SYSTEM FOR REDUCING AUTOMOTIVE EXHAUST EMISSIONS. *(Automotive Exhaust Control Corp., St. Petersburg, Fla.) U. S. Pat. 3,669,420. 6p., June 13, 1972. 11 refs. (Appl. Nov. 17, 1971, 4 claims).*

An auxiliary air/fuel mixture control system for use in a conventional carburetor-equipped automotive internal combustion engine has been designed with a time delay feature which allows for more complete hydrocarbon burn and results in reduction of exhaust emissions and increased performance. A sealed, thermally insulated diffusion chamber is coupled via a capillary tube to the fuel bowl of the carburetor with the capillary tube terminating at the upstream end of the diffusion chamber in a fuel jet nozzle which directs fuel into a venturi leading into the chamber. Several small air inlet holes upstream of the venturi intersect the fuel leaving the jet nozzle to effect a low temperature, thermally and molecularly changed air/fuel mixture which is highly diffused. This diffused mixture is delivered by means of insulated tubing from the diffusion chamber to the intake manifold downstream of the carburetor under a delayed or partially retained action, causing a great reduction in exhaust emissions with special effectiveness during deceleration of the vehicle. (Author abstract modified)

32266 **APTIC NO. 55029**

Low, George M. and Charles Mangion

SYSTEM FOR PRECONDITIONING A COMBUSTIBLE VAPOR. *(Assignee not given.) U. S. Pat. 3,640,256. 6p., Feb. 8, 1972. 4 refs. (Appl. Oct. 21, 1970, 9 claims).*

A fluidic system for controlling the flow of combustible vapor and for preheating the vapor of an automobile internal combustion engine has been designed to achieve more complete combustion and hence reduce pollution. The apparatus includes a housing adapted to be positioned between the carburetor and the intake manifold and contains a full-flow bore through which a flow of vaporized fuel-air mixture is established. A bypass conduit communicates with the bore at longitudinally spaced ports, and a heater is associated with the engine exhaust system and seated within the conduit. Several bias ports are associated with the bore in such a manner that as the velocity of the fuel-air mixture flow through the bore is varied, and the bias ports are selectively closed, predetermined quantities of the flow are diverted from the bore and caused to pass through the conduit to be preheated, prior to being delivered from the bore to the intake manifold. (Author summary modified)

32267 **APTIC NO. 55035**

Lowicki, Norbert and Hans Teggers

PROCESS FOR THE DIRECTIVE REMOVAL OF SO3 FROM WASTE GAS. *(Grillo- Werke A. G., Duisburg-Hamborn (West Germany)) U. S. Pat. 3,669,617. 6p., June 13, 1972. 2 refs. (Appl. Dec. 17, 1969, 21 claims).*

A process for treating sulfur trioxide-containing waste gases at relatively high temperatures has been developed which is particularly useful for lowering the dew point of flue gases; utilization of the residual heat of waste gases in heat exchangers is thus possible with the use of lower exchange temperatures. The flue gas is contacted at a temperature of 250 to 600 C with a fine-grained, non-hydrated absorbent containing an amphoteric component selected from manganese oxide or manganese hydroxide and a basic component selected from magnesium oxide or magnesium hydroxide for absorption of SO3 from the gas and lowering of the dew point. At least part of the gas is utilized as a heating medium in a heat exchange where the gas is cooled to a relatively low temperature but above the lower dew point. The residence time of the gas stream in contact with the absorbent is less than 3 sec, and the maximum degree of charge of the absorbent with sulfur is about 15% by weight. The sulfur-laden absorbent is regenerated by roasting at temperatures of 750 to 1000 C in the presence of a reducing agent, and the regenerated absorbent is returned into the SO3 absorption process.

32268 **APTIC NO. 54987**

Lyons, Ernest H., Jr.

ELECTROCHEMICAL CELL HAVING A BIPOLAR ELECTRODE. *(Lockheed Aircraft Corp., Burbank, Calif.) U. S. Pat. 3,655,547. 6p., April 11, 1972. 9 refs. (Appl. Aug. 27, 1969, 1 claim).*

An electrochemical cell having a bipolar electrode has been designed for the electrochemical oxidation and removal of flue gas contaminants such as sulfur dioxide with economy; the device also provides for recovering the SO2 in the form of sulfuric acid of marketable concentration. The electrochemical cell consists of a porous body with two large opposing surfaces, one functioning as the anode and the second functioning as the cathode. A continuous internal low resistance short circuiting electrical conducting path is provided between the two surfaces, and the cell body has several continuous small passageways which extend from one surface to the other and are adapted to be filled with a liquid electrolyte (aqueous sulfuric acid). A conduit communicates with the anode surface for applying SO2-containing flue gases directly against it, while another conduit communicates with the cathode surface for applying air directly against same. The SO2 is removed from the flue gases by direct electrochemical conversion to sulfuric acid.

32269 **APTIC NO. 54822**

Mamulov, F. G.

EVALUATION OF THE SELECTIVITY OF MOLECULAR ADSORBENTS. *(Ob otsenke selektivnosti molekulyarnykh adsorbentov). Text in Russian. Zh. Fiz. Khim., 46(2):425-430, 1972. 1 ref.*

The selectivity of molecular adsorbents was evaluated on the basis of kinetic and structural regularities for two-component gaseous mixtures. Equations were derived for the determination of the adsorption ability of these adsorbents in terms of quantities characteristic of the physical structure of the adsorbents. The influence of the pore radius on the adsorbent selectivity was established. Decrease of the adsorbate concentration with increasing depth of penetration of the adsorbate into the pores, assumed to be cylindrical, was observed. The rate of adsorption was equal to rate of adsorbate flow into the pore. In the case of adsorbents with very narrow pores, the selectivity factor, calculated by the kinetic method, equals approximately the square foot of the selectivity factor observed for the same adsorbent with very broad pores. The selectivity of the adsorbent is strongly reduced or destroyed by strong clogging of the pores.

32270 **APTIC NO. 55034**

Mayland, B. J.

IMPROVE NITRIC ACID PROCESSES. *Hydrocarbon Process., 51(5):141-144, May 1972. 8 refs.*

A review of the chemistry of nitric acid manufacture which includes possible manufacturing economies and pollution reduction techniques is presented. More acid can be made by greater surface area per unit volume in the recovery system, and air pollution resulting from oxides of nitrogen in the tail gas can be reduced by using the tail gas for bleaching air. Reaction zone tail gas loss depends upon the degree of reaction completion, and negligible losses can be achieved by scrubbing with a suitable absorbent. Utilization of stripped and cooled NNO3 for scrubbing can reduce NO losses to very low values; HNO3 vapor loss can be removed by adding water trays before the gas leaves the system. Since the bleaching process is mostly stripping, rather than oxidation, recycled tail gas can be used for additional stripping if needed. These ideas are incorporated to obtain nearly 100% recovery of acid product, reduce tail gas NOx to less than 50 ppm, and to produce acid of around 73% maximum concentration. A continuous catalytic absorption process which has application to any stream containing dilute NOx in air is also diagramatically presented. The system can reduce tail gas NOx to a tolerable level and also increase acid production.

32271 **APTIC NO. 54618**

McIlvaine, Robert W.

METHOD AND APPARATUS FOR DETERMINING THE DIFFICULTY OF REMOVING POLLUTANTS BY WET SCRUBBING ACTION. *(National Dust Collector Corp., Skokie, Ill.) U. S. Pat. 3,668,825. 9p., June 13, 1972. 11 refs. (Appl. Aug. 28, 1969, 20 claims).*

A method for determining the difficulty of removing pollutants from gases has been developed to permit the establishment of a standardized index which is responsive to the relative difficulty of removing various pollutants in a wet scrubbing operation. The method consists of passing a sample of the contaminated gas through a standard size wet scrubber stage, measuring the amount of pollutants remaining in the sample after scrubbing by passing the gas through a mechanical filter and weighing the amount of pollutant collected on the filter over a selected time period of operation, adjusting the pressure drop in the scrubber stage to obtain a desired level of pollutants remaining in the gas after passage through the scrubber, and providing the adjusted pressure drop as an index of the relative difficulty of removing the pollutants by wet scrubbing action. A percentage index between different operating pressures may be established by passing the gas through several standard size wet scrubbers, each having a flow orifice of selected size and operated at a selected pressure different from the size and pressure of the other wet scrubbers. This index will enable purchasers, vendors, and engineering consultants to accurately define or predict the magnitude or difficulty of a specific pollution control operation and can thus more accurately formulate specifications for appropriate equipment to do the job.

32272 **APTIC NO. 55032**

McKenzie, William A.

SMOKE POLLUTION ELIMINATOR. *(Assignee not given.) U. S. Pat. 3,667,193. 4p., June 6, 1972. 10 refs. (Appl. April 24, 1969, 6 claims).*

A relatively inexpensive smoke elimination device has been developed which, unlike prior art devices, is truly operative for complete cleansing of dust and dirt particles in smoke. The pollution eliminator is adapted for connection to the outlet of a chimney and includes a pump having a water supply and an outlet pipe which receives a substantially full line pressure flow of water from the pump. Smoke means connect to the outlet pipe for introduction of smoke into the water filled line, a settling tank is connected to the outlet pipe to receive the smoke-water mixture, and an aerator receives water from the upper portion of the settling tank for ultimate return of water to the pump for closed system water circulation purposes. (Author abstract modified)

32273 **APTIC NO. 55197**

McLean, Kenneth J.

THE COLLECTION OF PARTICULATES BY ELECTROSTATIC FORCES. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 73-79. 24 refs. (May 15-18.)*

A survey and evaluation is made of some recent developments in the collection of particulates by electrostatic forces. The basic requirements of future pollution control equipment will be high efficiency operation and the ability to collect fine particulates. High efficiency performance of conventional electrostatic precipitators will be severely limited by a number of factors including the size distribution of the particles and reintrainment during rapping. Improved performance can be expected in some cases by operating the precipitators in either the hot (700 F) or cold (220 F) modes and by using pulsed voltages for energization. The difficulty of collecting fine particulates is presented, but it is shown theoretically that collection of them is feasible with a two stage precipitator. The possibility of using charged water droplets for the removal of particulates is also presented, and reference is made to recent developments in this area. (Author abstract modified)

32274 **APTIC NO. 54656**

Mims, Samuel S.

TREATMENT OF OFF-GASES FROM NITRIC ACID OXIDATION OF ANOLONE. *(El Paso Products Co., Odessa, Tex.) U. S. Pat. 3,673,245. 4p., June 27, 1972. 3 refs. (Appl. Sept. 3, 1969, 11 claims).*

A procedure has been devised for the processing of the off-gases resulting from nitric acid oxidation of anolone (cyclohexanol and cyclohexanone mixture) in order to maximize the recovery and usage of the valuable components they contain. The gases evolved from the nitric acid oxidation, comprising nitrous oxide, carbon dioxide, nitric oxide, nitrogen dioxide, nitrogen, and small amount of carbon monoxide, are passed through the organic feed which is fed to the nitric acid reactors after they are first mixed with an oxygen-containing gas. The reactive oxidizing agents in these gases, viz., nitric oxide and nitrogen dioxide, react with the cyclohexanol/cyclohexanone mixture during this process to effect further oxidation. A portion of the highly exothermic reaction from the primary nitric acid reactor is transferred into an off gas scrubber which is operated generally at about room temperature. The oxidizing components of the off-gas react with the anolone mixture and are effectively removed. This has the effect of lowering the amount of nitric acid ultimately required for oxidation of the anolone feedstock by the almost complete utilization of the oxidizing nitrogen compounds contained in the off-gases.

32275 **APTIC NO. 54352**

Misarek, Joseph and William W. Jaxheimer

AIR POLLUTION CONTROLLER. *(Combustion Control Devices, Paterson, N. J.) U. S. Pat. 3,668,839. 5p., June 13, 1972. 2 refs. (Appl. May 28, 1971, 7 claims).*

A five-stage air pollution control system which is readily adaptable to all systems generating smoke, fly ash, toxic vapors, hydrocarbons, and other chemical pollutants has been designed for the removal and/or reclamation of these contaminants. The combination of a burner, forced air blower, perforated sheet at the discharge end of a venturi, fluted cone, and baffle arrangement causes agitation and swirling of the burning gases as they enter and progress through the afterburner chambers. Hydrocarbons are thus removed at a temperature of 1500-1900 F in the afterburner chambers, and the gases next enter a steam chamber which is also divided into a number of baffled compartments. Steam passes through nozzles and saturates the individual particles of the flue gases. The gases next pass into a fog chamber where nozzles emit a heavy water fog at a temperature of 190 F. The difference between the temperature in the fogging chamber and that of the saturated gases (approximately 600 900 F) produces a precipitation which causes a fallout of approximately 60 70% of the remaining contaminants in the gas. The remaining gases are washed in a series of fine mist chambers which continue the temperature provided by the fogging chambers. Particles falling into solution are removed by return lines and may be reclaimed in the form of water solutions. The final remaining gases pass through a spray chamber which washes the remaining fly ash in order to reduce the airborne moisture and to reduce the temperature of the flue gases leaving the stack. Again the contaminants are returned to a water tank.

32276 **APTIC NO. 54541**

Muroki, Takumi

EXHAUST GAS PURIFYING DEVICE FOR AN INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Aki-gun, Hiroshima (Japan)) U. S. Pat. 3,665,711. 4p., May 30, 1972. 6 refs. (Appl. June 9, 1970, 4 claims).*

An improved reactor (afterburner) for purifying the exhaust gas from an internal combustion engine has been designed to permit a supply of cool air to be delivered to a space between the inner and outer shells of the apparatus for the improvement of reactor shell durability and maintenance of purification function. Operationally, an air control valve is closed when the engine speed is below a predetermined value so that air supplied by a pump passes through a branch conduit is secondary air and is fed into the exhaust gas system. The air control valve is opened when the engine speed exceeds a predetermined value and when less secondary air is required for the burning of detrimental exhaust components to permit the pump-supplied air to be fed to the cooling space. Hence, the temperature of the exhaust gas within the reactor increases when the engine speed increases, but the inner shell is positively cooled by the air passing through the space; simultaneously, since no secondary air is fed to the exhaust system, the exhaust gas is not reburned within the reaction chamber and the temperature of the reactor is not increased. Reburning in the reactor is not greatly affected since the temperature within the reaction chamber is only lowered in the area adjacent the inner shell.

32277 **APTIC NO. 55112**

Murphey, Richard C.

SECONDARY AIR CONTROL IN CATALYTIC VEHICLE EXHAUST PURIFICATION SYSTEM. *(Mobile Oil Corp.) U. S. Pat. 3,662,540. 7p., May 16, 1972. 7 refs. (Appl. Dec. 30, 1970, 15 claims).*

An improved system for catalytic purification of internal combustion engine exhaust gases has been developed by controlling secondary air flow to a dual bed catalytic converter. Control of secondary air flow to a dual bed catalytic converter is provided by sensing engine temperature at a location remote from the converter and applying a control function in response to switch air flow between the first and second catalytic beds of the converter. During warm-up secondary air input is directed to the first catalyst bed, and then is switched to the second catalyst bed when the temperature in the flow path between the beds reaches about 1000 F. Engine temperature at a point remote from the beds, e.g., engine coolant temperature, is correlated to the temperature at the outlet of the first catalyst bed thereby enabling sensing of a significantly lower temperature level to control switching of air input to the catalyst beds. A secondary air control valve is operated by application of engine intake manifold pressure in response to sensed coolant temperature to switch secondary air input between the beds. Advantages include the provision of an oxidation atmosphere in the first bed which will produce reaction heat, thus accelerating warm-up. Expanded oxidation capacity will enhance the capability of the converter to react hydrocarbons and carbon monoxide at their heaviest concentrations. The ability to switch secondary air input away from a paint between the two beds allows its introduction upstream in the exhaust gas path, and therefore higher gas temperatures augment oxidation reactions while accelerating temperature rise. (Author abstract modified)

32278 **APTIC NO. 54501**

Murphy, Edmund

AIR-OR GAS-MOVING EQUIPMENT FOR USE WITH HEAT EXCHANGE AND/OR GAS-SCRUBBING APPARATUS. *(Cooling Development Ltd., Lucern (Switzerland)) U. S. Pat. 3,667,864. 5p., June 6, 1972. 3 refs. (Appl. May 7, 1970, 13 claims).*

An air- or gas-moving apparatus consisting of several fluid operated turbine and fan units connected in series for operation by a common operating fluid supply has been developed to assist the passage of cooling medium through heat exchange and/or gas-scrubbing devices. The units may be connected in several configurations, i.e., series-connection to a common operating fluid supply, independent connection to a common supply, and independent connection to independent supplies, sequences of two or more series-connected units to independent supplies, depending upon the size and/or overall linear dimensions of the heat exchange or scrubbing device, the number of fans required, and the desired or possible pressure of the operating fluid supply. Maximum use of the available power can be achieved by suitable choice of the number of units connected in series and/or of the number of sets of such series-connected units which in turn is dependent upon the available operating fluid pressure or head and the pressure drop occurring in each unit. Simple turbines which operate with a fluid pressure drop of from 5-10 ft of water may be used as well as reaction turbines of all types which operate with heads of 40-50 ft.

32279 **APTIC NO. 54882**

Nagoya, M.

ETHYL CYCLOHEXANE: NEWLY DEVELOPED SOLVENT WITH NO PHOTOCHEMICAL REACTIVITY. *(Hi kokagaku hanosei yozai ECH ni tsuite). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 16(12):29-32, Dec. 1972.*

Ethyl cyclohexane (ECH) solves the problems posed by oxidant pollution from photochemically reactive solvents and poor solubility of paraffin-based non-photochemical solvents. The specific gravity of ECH is 0.7920 (15/4 C), its boiling point 131.5 C (90% distilled), and its other properties are similar to those of the pure chemical. The aniline point is 43.8 C and the Kauri butanol number is 44 C, showing that ECH is much more soluble than toluene and xylene. The evaporation point is located at the favorable point between toluene and xylene. Ethyl cyclohexane is a useful solvent, especially as a dispersion agent or thinner. The difference in solubility between ECH and the universal aromatic solvents was solved by adding 20% aromatics to ECH. It may be used for varnishes, adhesives, and printing inks. It may also be used as a rubber solvent in place of gasoline, and in chemical reactions where the existence of sulfur and olefins are undesirable.

32280 **APTIC NO. 54982**

Nakajima, Yasuo, Yoshimasa Hayashi, and Sinichi Nagumo

EXHAUST GAS AFTER-BURNING SYSTEM. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,670,496. 6p., June 20, 1972. 6 refs. (Appl. July 27, 1970, 1 claim).*

A vehicular, internal combustion engine afterburner device for reducing emission pollutants has been developed to reduce such emissions only when the vehicle is running at relatively low urban speeds and to maintain high performance of the engine at relatively high speeds or under heavy load conditions. The device consists of a reactor for oxidizing the exhaust gases, a main exhaust pipe connected to an outer casing of the reactor, a bypass exhaust pipe connected to an inner casing of the reactor, a control valve in the exhaust bypass for controlling the flow path of the exhaust gases, and a control means for opening and closing the control valve in response to variations in vehicle speed and intake manifold vacuum of the engine. The control means consists of an actuator communicating with a point downstream of the carburetor and adapted to be actuated by the intake manifold vacuum, a solenoid valve located between the actuator and downstream point for controlling the communication therebetween, a vacuum switch connected to the solenoid and adapted to be operated by the intake manifold vacuum, and a speed switch responsive to the vehicle speed and connected in parallel with the vacuum switch.

32281 **APTIC NO. 55101**

Niessen, Walter R., Adel F. Sarofim, C. Michael Mohr, and Raymond W. Moore

AN APPROACH TO INCINERATOR COMBUSTIBLE POLLUTANT CONTROL. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 245-259. 20 refs. (June 4-7.)*

Combustible pollutants such as soot, hydrocarbons, and carbon monoxide contribute significantly to incinerator air pollution. Control of these pollutants is best accomplished by completely burning them, a process limited, in part, by inadequate mixing with sufficient air within the furnace. Analysis methods are proposed which allow quantitative estimation of the generation rate of combustibles along the bed. The overfire air requirement and distribution, estimates of the flow path and velocity of the gases as they pass through and out of the chamber are specified. Significant accelerations which could increase erosion effects and which would deflect overfire air jets are shown. Relationships for evaluation of individual overfire air jets are given, and illustrative calculations are presented to show the utility of the analyses. (Author abstract)

32282 **APTIC NO. 54693**

Nunn, Howard R.

ANTI-POLLUTION CHAMBER. *(Assignee not given.) U. S. Pat. 3,668,841. 3p., June 13, 1972. 5 refs. (Appl. Nov. 4, 1970, 1 claim).*

An anti-pollution device having a hollow conical chamber which is supported upon legs atop an industrial building roof has been designed to replace the conventional smoke stack. An elbow introduces smoke into the main body of the chamber, and several high pressure fog-producing nozzles on the main body produce 100% saturation of the interior. Pollution sensing devices are situated on the chamber interior for indicating the degree of pollution of the introduced smoke. The chamber also has a baffle containing a stack means for emitting purified air, while a catch basin is provided as a pollutant drain-off for return of the impurities to sumps at a lower level. The position of the fog nozzles tends to move the particles in a circular motion toward a point of exit to the outside atmosphere, with the circular motion retarding the vapors only long enough to permit extraction of the particles in the gas. A stack of short length is provided with a baffle which is positioned angularly upwards and is of a number necessary to restrict the uptake until the pollutants are reduced to nearly zero. Pollutants in the catch basin are carried down a return line to sumps and are filtered in solution, while the water and chemicals are recycled by pumping through the lines having nozzles.

32283 **APTIC NO. 54333**

Page, Gordon C. and Robert M. Bethea

THE COLLECTION OF LINT FLY BY WET IMPINGEMENT. *J. Air Pollution Control Assoc., 22(5):372-373, May 1972.*

The effectiveness of a combined water scrubber impinger used to control lint cleaner effluent from machine stripped short staple cotton was investigated. A lint skimming technique was used in the trash water separator. The lint and dust laden water flowed from the scrubber to the first of two settling tanks. The wet lint was skimmed off the water surface by a baffle inclined 70 deg to the direction of water flow. The lint passed across the baffle and out of the drainage notch where it was caught by a porous sack placed in a drum. Samples of the entering and exiting particulate were collected for gravimetric analysis. Three variables were selected to test scrubber performance: inlet process air rate, pressure delivered to the nozzle taps, and the number of sprays. In the first test a 4 by 4 Latin square was used. A second series of tests were performed as a symmetric balanced incomplete block with three full replications. None of the variables had any effect on particulate removal. The most significant result is the ninefold decrease in particulate matter when the scrubber was in operation.

32284 **APTIC NO. 54436**

Paretsky, Leon Carl

FILTRATION OF AEROSOLS BY GRANULAR BEDS. *New York City Univ., N. Y., Dept. of Chemical Engineering, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 312p. 68 refs.*

The mechanics governing the filtration of both monodispersed dilute aerosols and power station fly ash by granular beds was investigated. Initially, experimental studies of the filtration of dilute aerosols of Dow microspheres by beds of sand were conducted with flows passing vertically upward, vertically downward, and horizontally. Face velocities of 0.3 to 70 cm/sec, using 10-14 and 20-30 mesh sand were investigated. The single particle collection efficiency was independent of bed height. Filtration was primarily by diffusion and gravity settling at low velocities, and by inertial impaction at high velocities. Upshot flow gave lower single particle collection efficiences than downshot flow, indicating the importance of gravity settling as a filtration mechanism. Experimental results were correlated reasonably well by semi-empirical, semi-theoretical considerations taking into account filtration by the above-mentioned mechanisms. An overall theoretical-empirical filtration model was obtained by adding the single particle collection efficiencies of each of the filtration mechanisms. Fly ash filtration was studied at velocities low enough to promote formation of a filter cake. Studies on the horizontal sand bed indicated that the structure of the fly ash filter cake varied with the face velocity and the method of deposition. Shifts in the face velocity on a deposited filter cake altered the structure. A filter cake thickness of 0.14 g/sq cm had a collection efficiency of over 99.99% against the 1.1 micron Dow microspheres. Cyclic operation of the panel bed filter produced fly ash collection efficiencies in excess of 99.9% at a face velocity of about 11 ft/min, and with a fly ash filter cake pressure drop of about 1/2 in. water. The nature of the filter cake was investigated by passing a dilute aerosol of 1.1 micron Dow microspheres through the filter cake. It is best to perform this test at the same velocity at which the filter cake is deposited. (Author abstract modified)

32285 **APTIC NO. 54723**

Penquite, Charles R. and George E. Barker

APPARATUS AND PROCESS FOR TESTING EXHAUST GAS CATALYST SYSTEMS. *(Monsanto Co., St. Louis, Mo.) U. S. Pat. 3,667,914. 8p., June 6, 1972. 2 refs. (Appl. Nov. 3, 1970, 22 claims).*

A method for evaluating and testing catalytic systems used in the treatment of exhausts from hydrocarbon engines has been designed to kinetically test under one set of conditions and to perform flow measurements across the catalyst under another set of conditions in order to determine attrition of the catalyst without removing it from the test reactor. The reactor system contains a sample tube which is provided with a diametrally reduced portion having a glass wool plug upon which the catalyst is disposed. The sample tube is inserted into an electric resistance heater or furnace, and a predetermined exhaust gas mixture is passed through the catalyst bed at a desired test temperature. Periodically, without removing the catalyst sample from the sample tube, a pressure drop measurement is made across the sample tube in order to determine the degradation of the catalyst bed. The exhaust gas mixtures are passed through the catalyst bed at a predetermined rate designed for laboratory scale equipment except for the period of pressure drop measurement during which a precisely reproducible gas flow rate appropriate for catalyst degradation is maintained.

32286 **APTIC NO. 54365**

Petit, Roland, Jean Louise, Jean-Claude Parent, and Leon Hay

METHOD OF PURIFYING GASEOUS MIXTURES. *(L Air Liquide, Societe Anonyme pour l Etude et l Exploitation des procedes Georges Claude, Paris (France)) U. S. Pat. 3,689,212. 7p., Sept. 5, 1972. 10 refs. (Appl. Dec. 22, 1969, 18 claims).*

An improved process is described for purifying gaseous mixtures containing primarily nitrous oxide with various impurities such as nitric oxide, nitrogen dioxide, nitrogen tetraoxide, and ammonia. The mixture undergoes at least one preliminary treatment to eliminate impurities such as NO2, N2O2, and NH3, after which it is further purified to remove traces of residual NO. The latter purification process consists of bringing the mixture into contact with an adsorbent mass consisting of a molecular sieve composed of a material such as natural, artificial, or synthetic zeolite; this sieve is charged with a metal in the metallic form. Examples are given in which the adsorbent mass is composed of mordenite and iron, nickel, copper, and cobalt; the results of various operating conditions are also exemplified. Variations in addition to those discussed are also possible.

32287 **APTIC NO. 54310**

Predikant, Hans H., Hermann Betz, and Johann Schaeffer

PROCESS FOR PURIFYING INDUSTRIAL WASTE GASES CONTAINING FLUORINE VALUES. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,660,019. 5p., May 2, 1972. 6 refs. (Appl. Jan. 29, 1970, 6 claims).*

A continuous process for removing fluorine and hydrogen fluoride from industrial waste gases evolved in the manufacture of aluminum through electrolysis of alumina in the presence of cryolite has been developed to avoid precipitation of sodium fluoride within the washing zone by the neutralization of the main amount of hydrogen fluoride in a separate neutralization zone. The waste gases are scrubbed within a first washing zone with aqueous hydrogen fluoride and within a second washing zone with aqueous sodium hydroxide. The effluent of the first washing zone is then recycled to the first washing zone until the concentration of hydrogen fluoride is as least about 3% by weight, while the effluent of the second washing zone is recycled to the second washing zone to enrich sodium fluoride as long as the concentration of sodium fluoride within the aqueous sodium hydroxide is still below the solubility product. The concentrated effluents from both washing zones are then combined within a neutralization zone, and the precipitated sodium fluoride is separated from the mother liquor which is recycled to the first washing zone.

32288 **APTIC NO. 54528**

Revoir, William H. and John A. Jones

ABSORBENTS FOR REMOVAL OF MERCURY VAPOR FROM AIR OR GAS. *(American Optical Corp., Southbridge, Mass.) U. S. Pat. 3,662,523. 5p., May 16, 1972. 1 ref. (Appl. Dec. 15, 1970, 2 claims).*

An improved adsorbent material for the removal of toxic mercury vapor from air or gases has been devised which permits a longer useful life for a given size filter element or, conversely, a smaller size filter element for a given useful life. The adsorbent composition consists of activated carbon granules impregnated with an interhalogen compound such as iodine monochloride or, preferably, iodine trichloride. These compounds react with mercury to produce mercuric iodide and mercuric chloride. The pronounced improvement in the efficiency of the interhalogens as mercury adsorbents, as compared to iodine, is partially accounted for by the greater reactivity of interhalogen compounds as compared to individual halogens. The adsorbent may be used in individual respirators or on large industrial processing equipment containing mercury.

32289 **APTIC NO. 54615**

Richardson, Harry L. and Robert C. Craig

ELECTROSTATIC PRECIPITATOR. *(Chemical Construction Corp., New York) U. S. Pat. 3,668,836. 5p., June 13, 1972. 10 refs. (Appl. Jan. 22, 1970, 5 claims).*

An electrostatic precipitator has been designed which provides greater overall removal of entrained discrete particles from gas streams such as flue gas, chemical process gas, or tail gas from chemical processing. The vapor stream laden with particulates such as liquid droplets, fume, dust, soot, and fly ash is passed through a duct in which a perforated plate is transversely disposed. The gas stream initially passes through the openings in the first plate which is succeeded by alternate juxtaposed transverse banks of parallel spaced wires and secondary perforated plates. The plates are grounded and the wires are provided with an electrostatic charge to permit discharge of the entrained particles onto the plates. The provision of the first plate prior to the initial wire or bank of parallel wires is highly advantageous since a considerable proportion of particles will deposit on the first plate upstream of the initial bank of wires, thus improving the overall particle collection efficiency. (Author summary modified)

32290 **APTIC NO. 55098**

Robin, Allen M. and Joseph P. Tassoney

HIGH PRESSURE WATER-GAS SHIFT CONVERSION PROCESS. *(Texaco Inc., New York) U. S. Pat. 3,652,454. 6p., March 28, 1972. 17 refs. (Appl. May 27, 1968, 2 claims).*

An improved continuous high pressure catalytic water-gas shift conversion process has been developed for maximum conversion of a gas stream containing carbon monoxide into essentially hydrogen and carbon dioxide whose composition is maintained substantially constant throughout the life of the catalyst. Process design and operation are optimized to yield an overall CO conversion of about 80 to 98 mole % over a period of 2 years or more on stream. Steam and a CO containing feedstream are reacted in adiabatic catalytic reaction zone consisting of one or more fixed beds of iron-chromium oxide catalyst connected in series and provided with interbed cooling. The catalyst is characterized by its activity increasing as a function of pressure over the operating range of about 35 to 250 atm, contrary to the present general idea that the activity of an iron oxide shift catalyst levels out at about 400 psig. The temperature of the gases leaving each bed is maintained in the range of about 30 to 100 F less than the corresponding equilibrium temperature. The inlet and exit temperatures of the gas stream in each bed are increased as logarithmic functions of time on stream to offset catalyst deactivation.

32291 **APTIC NO. 55105**

Rogers, J. E., A. F. Sarofim, and J. B. Howard

EFFECT OF UNDERFIRE AIR RATE ON A BURNING SIMULATED REFUSE BED. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 135-144. 11 refs. (June 4-7.)*

A versatile test incinerator was designed to measure the burning and ignition rates in simulated refuse beds. Provision is made for the measurement of refuse weight and temperature distribution within the refuse bed during the batch burning. Concentrations of carbon monoxide, carbon dioxide, and oxygen are measured at selected positions within and above the bed. Results from preliminary tests are used to provide a measure of the influence of underfire air rate on burning rate, ignition rate, and the fraction of the total energy of combustion that is released within the bed. (Author abstract modified)

32292 **APTIC NO. 54355**

Rossel, Joseph

POLLUTION CONTROL SYSTEM. *(Assignee not given.) U. S. Pat. 3,666,422. 3p., May 30, 1972. 7 refs. (Appl. Feb. 12, 1971, 6 claims).*

An inexpensive and simplified pollution control system for connection to the exhausts of automobiles, incinerators, or fuel oil burners has been designed to utilize a pneumatic pump to pull exhaust gases and air through an afterburner section. The afterburner section includes a glow head for ignition of unburned exhaust gases and an air inlet to permit the mixing of oxygen with the unburned exhaust gases. Cooling and mixing chambers are included at the output of the afterburner compartment so that the exhaust gases can be fed into a pneumatic pump where they will be applied to a filtering system, preferably consisting of charcoal, before the gas enters the atmosphere. The pump is designed to maintain a reduced pressure within the afterburner chamber so that air will enter through apertures to aid in the ignition of volatile exhaust components.

32293 **APTIC NO. 54795**

Sahm, Paul A.

ANTI-POLLUTION SYSTEM FOR SOLID FUEL-FIRED STEAM GENERATING POWER PLANTS. *(Assignee not given.) U. S. Pat. 3,682,139. 3p., Aug. 8, 1972. 6 refs. (Appl. June 15, 1971, 7 claims).*

An anti-pollution system for solid fuel-fired power stations has been designed to eliminate smokestacks. The system consists of a steam generator and a furnace having steam generating tubes along its walls, an outlet for the discharge of hot gaseous products of combustions, and a means for introducing ash-containing fuel and combustion air into a portion remote from the outlet. An ash pit is situated below the furnace, and means are provided for flushing ash from the pit to an ash settling pond. A pump and conduit connect the outlet with the ash flushing means for passing the hot gaseous combustion products from the furnace outlet to the settling pond. (Author abstract modified)

32294 **APTIC NO. 55083**

Santoleri, Joseph J.

CHLORINATED HYDROCARBON WASTE RECOVERY AND POLLUTION ABATEMENT. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 66-74. 8 refs. (June 4-7.)*

The disposal and recovery of chlorinated hydrocarbon wastes via conventional incineration is costly and creates air pollution. The Thermal/Nittetu system has been developed based on the Thermal Vortex burner for the incineration process and the Sub-X system for quenching the exhaust gases by direct contact of the gas with liquid. It is possible to recover hydrochloric acid at lower than azeotropic concentration, at higher than this concentration, or as anhydrous HCl gas. Essentially complete combustion is achieved with complete decomposition of the organics; wastes containing less than 70% chlorine can be burned without auxiliary fuel. In most vinyl chloride monomer plants, the acidic waste gases and liquids discharged at various points in the process are absorbed in water to produce a dilute hydrochloric acid; this acid is then neutralized. To recover HCl at concentrations greater than the azeotropic mixture in the absorption tower (10%), the absorber produces dilute acid of 15 to 20% concentration which is purged from the tower, and the combustion gases and HCl vapor can be separated. Directly above the absorption tower is a scrubbing tower, and the stack gases from this tower contain nitrogen, carbon dioxide, water vapor, less than 1 ppm HCl, and 10 ppm chlorine. The extractive distillation process, which involves stripping with a solvent, is used to recover HCl acid at higher than azeotropic concentration from an acid that is less than the azeotropic. In order to produce a dry anhydrous HCl gas, the overhead vapor leaving the extractive distillation process is cooled in water condensers and eventually in brine coolers.

32295 **APTIC NO. 54547**

Sarto, Jorma O.

COOL EXHAUST RECYCLING. *(Chrysler Corp., Highland Park, Mich.) U. S. Pat. 3,662,722. 6p., May 16, 1972. 4 refs. (Appl. April 22, 1970, 19 claims).*

An automobile exhaust recycling system has been designed which is particularly adapted for use with lead-containing fuel and which achieves preheating and improved mixing and carburetion of the fuel-air mixture in the inlet header, the reduction of ice formation on the customary throttle blade, and the reduction of noxious nitrogen oxides in the exhaust. A fraction of the exhaust gases at the muffler are withdrawn from the primary exhaust flow and conducted into a sound attenuating, dead-end chamber which serves to damp the sound waves and to cool the comparatively quiescent gases to below a temperature at which a significant portion of lead contaminants solidify. A portion of the cooled exhaust gases are then conducted to the air inlet system for the engine and are thence recycled through the combustion chamber to effect a controlled combustion temperature sufficiently low to effectively reduce the formation of noxious oxides of nitrogen, yet sufficiently high to obtain efficient engine operation. The recycled exhaust gases are preferably not less than 200-250 F at their introduction into the engine air inlet system so as to be useful in preheating the inlet air. The recycling may be accordingly performed at a location above the customary engine throttle valve to facilitate mixing and vaporization of liquid fuel droplets and to reduce ice formation at the throttle.

32296 **APTIC NO. 54343**

Sawada, Hiraki and Kenji Masaki

ENGINE EXHAUST GAS OXIDIZING SYSTEM. *(Assignee not given.) U. S. Pat. 3,662,541. 10p., May 16, 1972. 9 refs. (Appl. March 15, 1971, 9 claims).*

An automobile engine exhaust gas oxidizing system has overcome the problems of complexity, reduced performance, and noise inherent in prior recombustion systems by burning the unburned exhaust content before it is released from the exhaust system. The system includes an exhaust port located immediately downstream of an exhaust valve and an exhaust manifold communicating with the exhaust port. A system for oxidizing engine exhaust gases discharged into the exhaust port comprises an air inlet pipe in communication with the atmosphere and opening into the exhaust port to directly sense pressure pulsations of the exhaust gases. The inlet pipe extends in a direction opposite to the exhaust gas flow and has an opening to deliver a flow of air into the exhaust gases adjacent the exhaust port. A one-way valve mounted on the inlet pipe is responsive to the pressure pulsations of the exhaust gases in the exhaust port to effect periodic closing of the air inlet when positive pressures exist in the exhaust port; periodic opening occurs only when negative pressure is present in the exhaust port. Hence, atmospheric air is introduced into the exhaust port only during negative pressures and in a direction other than that of the exhaust flow.

32297 **APTIC NO. 55024**

Scott, John W.

METHOD FOR OXIDIZING A MERCAPTAN COMPOUND DISPERSED IN AIR. *(Assignee not given.) U. S. Pat. 3,657,087. 8p., April 18, 1972. 2 refs. (Appl. July 24, 1969, 7 claims).*

An apparatus and method for oxidizing low concentrations of mercaptan compounds (less than 300 ppm) has been developed to achieve reduction in concentration of noxious odor producing pollutants. The dispersion of mercaptan compound in air is contacted with ultraviolet light (1700 to 3000 A) in a reaction chamber containing a low pressure mercury vapor lamp. Means may also be provided for contacting the dispersion with mercury vapor in the chamber to thereby increase the rate of oxidation. The reaction is preferably carried out at ambient or room temperature, and baffle means may be supported in the chamber to create turbulence as the dispersion is caused to flow therethrough.

32298 **APTIC NO. 55054**

Shah, Indravadan S.

CENTRIFUGAL FILTRATION OF MAGNESIUM SULFITE SLURRIES.

(Chemical Construction Corp.) U. S. Pat. 3,655,338. 3p., April 11, 1972. 4 refs. (Appl. June 10, 1970, 6 claims).

A method for processing the bleed stream of aqueous magnesium sulfite slurry overcomes prior art deficiencies in producing a cake of minimum moisture and therefore reducing the heat requirement of the subsequent dryer and calciner. The slurry, derived from the scrubbing of a waste gas stream dioxide removal with a circulating aqueous magnesium oxide-sulfite slurry is passed through a thickener so as to decant clear liquor, and the thickened slurry is heated to convery magnesium sulfite hexahydrate to the trihydrate form. The slurry is then passed through centrifugal separation means under controlled conditions of feed rate, initial total solids centent and speed in revolutions per minute (rpm) of the centrifuge, so as to produce a residual wet solids cake with a moisture content of less than 5% by weight and an aqueous solution phase containing less than 1% residual solids by weight, (Author abstract modified)

32299 **APTIC NO. 54745**

Smith, Billy Shelton

TRANSFORMATIONS OF SULFUR DIOXIDE IN WASTE STABILIZATION PONDS.

Oklahoma Univ., Dept. of Environmental Sciences, Thesis, (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 78p. 64 refs.

The mechanisms of the transformation nature, and distribution of sulfur compounds formed after sulfur dioxide was scrubbed from an air stream into waste stabilization ponds (WSP) were studied. The performance of such WSP over an extended time period and the effect of adding carbon dioxide to the SO2-air stream were also studied. In order to determine the fate of the SO2 scrubbed into the ponds, analyses were conducted on the WSP influent and effluent, after a 2-month acclimation period, for sulfate, sulfite, the sulfur ion, elemental sulfur, and dissolved SO2 over a 3-month period. The effects on WSP performance were evaluated by determining the biochemical oxygen demand (BOD), organic nitrogen, pH, and observing the appearance and odor of the pond. Sulfur dioxide at a concentraiton of 1000 ppm was effectively removed from the air stream by use of the WSP, and it continued to perform at a reasonable level. The principal forms of sulfur compounds found in the WSP were sulfate and dissolved SO2. The ponds could be expected to continue functioning as an effective SO2 scrubbing device and treatment method to remove BOD. Increasing the temperature of the pond raised the rate of BOD removal and decreased the amount of dissolved SO2. Addition of CO2 interfered with the BOD removal, but did not appear to affect the amount of dissolved SO2. The reduction of BOD primarily reflected degradation of carbonaceous matter with little input from nitrification. The WSP effluent containing high hydrogen ion concentrations and low amounts of SO2 is unsatisfactory for discharge into the environment. This effluent could be neutralized with lime and subjected to additonal stabilization to yield an effluent acceptable for discharge. (Author conclusions modified)

32300 **APTIC NO. 55095**

Smith, Richard D. and Dale A. Furlong

AIR POLLUTION-FREE INTERNAL COMBUSTION ENGINE AND METHOD FOR OPERATING SAME.

(Combustion Power Co., Inc., Palo Alto, Calif.) U. S. Pat. 3,672,341. 11p., June 27, 1972. 17 refs. (Appl. July 30, 1970, 34 claims).

An air pollution-free internal combustion engine has been developed which eliminates the emission of unburned hydrocarbons and carbon monoxide by progressive injection and burning of fuel. A typical engine cycle includes closure of the exhaust valve prior to completion of the exhaust stroke of the piston in order to entrap a limited amount of exhaust gas in the cylinder as a working fluid. Subsequent to exhaust valve closure and prior to the piston reaching top dead center, a metered amount of substantially pure oxygen gas is injected into the cylinder while relatively low pressures exist in the cylinder. Sufficient oxygen is injected to provide at least the stoichiometric amount required in the oxygen-fuel combustion reaction. Metered amounts of fuel such as gaseous hydrogen, diesel fuel, or gasoline are then progressively injected under high pressure into the oxygen contained in the cylinder. A glow plug or other suitable ignition device is positioned in proximity to the fuel injector to produce combustion of the fuel and oxidant. The fuel is injected in a manner which is similar to that of a diesel engine and which insures the progressive burning of the fuel. The exhaust valve opens upon complete combustion, and water is injected during the exhaust stroke to cool the cylinder walls, piston, dome, combustion chamber, and exhaust gas by vaporization of the water into steam.

32301 **APTIC NO. 55149**

Stairmand, C. J.

SELECTION OF GAS CLEANING EQUIPMENT - MAKING THE CHOICE.

Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 199-204. 3 refs. (May 15-18.)

The performance of available dust-arresting equipment is reviewed with an outline of the applications of 18 main types, including various collectors and scrubbers, electrostatic precipitators, fabric filters, and spray dedusters. Typical collection efficiency data is provided for each major type in tabular and graphic form, and a chart is included displaying the influences of operating conditions on choice of gas cleaning equipment. All of the devices except the inertial collector and medium efficiency cyclone approach 100% efficiency in removing coarse particles (50 micron) and could therefore be regarded as suitable for avoiding a dust problem, while only the most sophisticated equipment gives a worthwhile reduction in the emission of haze-producing particles. A simple method is provided for making a preliminary choice of equipment for a particular duty with the aid of a dust grading chart. Factors affecting performance which should be considered subsequent to the preliminary choice are also discussed.

32302 **APTIC NO. 54701**

Sueyoshi, Hideo and Yoji Kitaoka

MAKE FUEL FROM PLASTIC WASTES.

Hydrocarbon Process., 51(10):161- 163, Oct. 1972.

The Mitsui Plastic Waste Thermal Cracking Process which converts low molecular weight polyethylene by-products into fuel oil by thermal cracking at the rate of 36 tons/day has demonstrated that thermal cracking of waste plastics for oil recovery is a viable process. The low polymer thermal cracking equipment is operated at approximately 420 C, and by-product gas is flared. Product oil is mixed with heavy fuel and used as fuel in the power plant. Carbon sludge produced in the thermal cracker is continuously removed by an incorporated system, and fuel for the thermal cracker is supplied completely from the residual oil make. To avoid technical problems and poor economy of the cracking process, plastic wastes must be easily collected and separated; corrosive or poisonous gases, e.g., hydrogen cyanide and hydrogen chloride, must not be generated; the yield must be high, 80% being the minimum; and foreign materials, e.g., metal and glass used in molding, must be excluded. Polyvinyl chloride materials are not suitable for the process since the theoretical yield is about 40% and the chloride content of the polyvinyl chloride remains as organic chlorides in the oil which corrode the boiler when used as fuel. The process does not seem to be applicable to city rubbish disposal due to the difficulty in separating the plastics by their various types and kinds. The product oil yield of the process is approximately 90%, and the oil is of good quality as a fuel.

32303 **APTIC NO. 54631**

Taheri, M., S. A. Beg, and M. Beizaie

GAS CLEANING IN A WETTED BUTTERFLY VALVE. *J. Air Pollution Control Assoc., 22(10):794-798, Oct. 1972. 12 refs.*

The utility of a wetted butterfly valve for cleaning flue gases from industrial wastes was investigated. Butterfly valves are extensively used to control the gas pressures in various processes. A small pilot plant with a maximum airflow rate of 400 cu ft/min and water flow rate of 4 g/min was constructed to provide the desired testing conditions. The results indicate that for a pressure drop greater than 30 in. water, a collection efficiency of greater than 95% for submicron particles can be obtained. For particles larger than 1.7 micron diameter, efficiencies of greater than 99% were obtained. The exceptional suitability of wet butterfly valves for gas cleaning is demonstrated by the flexibility to adjust to large variations of gas and liquid flow rates. (Author abstract modified)

32304 **APTIC NO. 54621**

Torrence, Samuel L.

REMOVAL AND RECOVERY OF SULFUR OXIDES FROM GASES. *(Westvaco Corp., New York) U. S. Pat. 3,667,908. 5p., June 6, 1972. 8 refs. (Appl. Nov. 27, 1970, 3 claims).*

A continuous process for removing sulfur dioxide and sulfur trioxide from flue gases has been developed. Regenerated carbonaceous adsorbent losses due to carbon burn-off are low enough to justify the use of a hard granular activated carbon which has elemental sulfur adsorbed thereon. The gas stream to be purified is passed above the dew point of sulfur trioxide into contact with the sulfur containing activated carbon adsorbent at a temperature below 350 F to permit the hydrolysis of sulfur trioxide to sulfuric acid and subsequent adsorption onto the activated carbon adsorbent. The gas stream is then passed into contact with additional amounts of activated carbon adsorbent at a temperature between 200 and 260 F to adsorb sulfur dioxide as sulfuric acid. The sulfuric acid and elemental sulfur containing activated carbon adsorbent are then heated to a temperature between 350 and 700 F to cause the formation of sulfur dioxide from the sulfuric acid and elemental sulfur without significant reaction of any of the activated carbon adsorbent. The sulfur dioxide is then recovered from the adsorbent, and at least of portion of it is reacted with coke for reduction to vaporous elemental sulfur which in turn is adsorbed onto the activated carbon adsorbent subsequent to the sulfur dioxide recovery step. The activated carbon adsorbent can then be recycled into contact with the gas stream. An improved process for sequential removal of SO2 and SO3 from a gaseous stream is provided, thereby permitting the gas stream to be passed into the atmosphere, pollution-free. This invention provides an SO2 removal process utilizing a highly activated carbon possessing significantly higher rate and capacity characteristics than the previously-used, low-cost char.

32305 **APTIC NO. 54518**

Van Decar, C. Ted

PLYWOOD VENEER DRYER CONTROL DEVICE. *J. Air Pollution Control Assoc., 22(12):968, Dec. 1972. 1 ref.*

A pilot control device that eliminates the blue haze plume from commercial plywood veneer dryers by condensing the hydrocarbon vapors in a finned tube matrix heat exchanger condenser is described. The pilot unit handles 500 cu ft/min of veneer dryer emission gas. The unit was designed using basic heat transfer techniques and knowledge of veneer dryer emissions. The two factors responsible for the success of the pilot unit are a large surface for condensation and laminar flow. Finned tubing provides the large surface area for condensing the hydrocarbon vapors. To prevent the formation of a hydrocarbon fog while maximizing the condensation of hydrocarbon vapors on the condenser surfaces, a temperature gradient was established by maintaining laminar flow of the emission gas through the unit. If the hydrocarbon vapors had been rapidly cooled below their dew point in the bulk gas stream, the condensing vapors would have formed droplets entrained in the gas stream and thus be emitted to the atmosphere as a visible blue haze plume.

32306 **APTIC NO. 54356**

Vicard, Pierre

ELECTROSTATIC DUST SEPARATOR. *(Assignee not given.) U. S. Pat. 3,668,835. 6p., June 13, 1972. 10 refs. (Appl. Feb. 3, 1970, 7 claims).*

An electrostatic dust separator has been designed with an axial high voltage electrode in a venturi unit for ionization of the dust particles suspended in a gas for subsequent separation. An annular nozzle produces a spray of auxiliary substance such as water in the gas stream issuing from the venturi around a polarizing electrode. The coarse particles of the spray are electrified and attract and retain the finer ionized dust particles carried by the gas. The spraying nozzle may be situated within an auxiliary venturi to increase the velocity of the gas and to improve impact effects between the dust particles and the sprayed particles. The ionizing electrode is preferably formed with fins to enhance the ionizing corona discharge, while the polarizing electrode is smooth to avoid any noticeable discharge effect. The gas to be treated may be fed into the inlet of the main venturi by an injector nozzle to produce a negative pressure such that a portion of the gas issuing from the main venturi is recycled into same through an annular passage provided around the main venturi. (Author abstract modified)

32307 **APTIC NO. 54379**

Vincent, James Henry

COLLECTING APPARATUS FOR ELECTROSTATIC PRECIPITATORS. *(American Standard Inc., New York) U. S. Pat. 3,664,092. 6p., May 23, 1972. 13 refs. (Appl. Aug. 24, 1970, 6 claims).*

An apparatus for collecting dust, dirt, and other particulate matter deposited upon one or more of the grid elements of a multi-grid electrostatic precipitator has been designed to accumulate such material on the final grid element for subsequent dislodgement and removal to a remote point. A key element of the invention involves a tray or series of trays, each affixed to a grid element for collection by gravity of particles deposited on the element. The surface of the tray is preferably inclined at a small predetermined angle so that particulate matter reaching the surface of the tray will be allowed to move in one and in the same direction after collection by the tray. Any well-known type of rapper may be associated with one or all of the grid electrodes to aid in dislodgement of the particles from the grids for collection by the trays. A vibrator may be associated with the tray to assist in urging the particles along a unidirectional path to a common exit port for deposition.

32308 **APTIC NO. 54705**

Vroom, Alan H.

NEW USES FOR SULFUR: THE CANADIAN VIEWPOINT. *Hydrocarbon Process., 51(7):79-85, July 1972. 17 refs.*

Canadian research is presently directing itself at new uses for the 6 million long tons of stockpiled sulfur and the ever increasing involuntary production of sulfur from the processing of gas and from petroleum refining. The increasing quantities of elemental sulfur and sulfur dioxide being recovered from petroleum refining, residual fuel oils, and smelter gases could result in an increase of involuntary world sulfur production of 22.5 million long tons/yr by 1975 if recovery were pushed to 90%. Moreover, research is being conducted to develop practical methods of sulfur value recovery directly from coal and from stack gases resulting from its combustion; the present potential here is some 45 million tons/yr on a world basis or about twice the present demand for elemental sulfur. The year 1970 saw 21% of the total potential Canadian sulfur emissions recovered, and it is estimated that by 1980 pollution abatement programs will result in a 76% recovery. Some proposed uses for the growing surplus are: sulfur foam insulation, sulfur concrete, sulfur-asphalt paving materials, traffic paints, sulfur impregnant for porous materials, and surface bond construction. The largest and most immediate market in Canada for new sulfur uses would appear to lie in road building and repair which could result in the use of 600,000 tons per year.

32309 **APTIC NO. 54268**

Welty, Albert B., Jr.

SULFATE CONTROL IN AMMONIA FLUE GAS DESULFURIZATION. *(Assignee not given.) U. S. Pat. 3,676,059. 6p., July 11, 1972. 7 refs. (Appl. June 1, 1970, 5 claims).*

An improved process for the conversion of hexavalent sulfur back to sulfur dioxide in an absorber apparatus for the removal of sulfur dioxide from flue gas has been developed to prevent the buildup of sulfate in the system, to enhance the yield of sulfur dioxide as compared to prior art processes, and to increase the amount of useful by-product such as sulfur or sulfuric acid obtained. Sulfur dioxide is removed from flue gas by absorption in an aqueous solution of ammonium sulfite or ammonia, with some oxidation of tetravalent sulfur to the hexavalent state occurring. At least a portion of the absorber effluent solution is regenerated by acidification with ammonium bisulfate to liberate sulfur dioxide and to form an aqueous ammonium sulfate-ammonium bisulfate slurry. This slurry is introduced into a decomposition zone where a major portion of the salt content is decomposed into ammonium bisulfate and ammonia and a minor portion into a gas mixture consisting of ammonia, nitrogen, sulfur dioxide, and steam. The ammonium bisulfate thus produced furnishes the bisulfate used for liberation of sulfur dioxide. The gas mixture formed in decomposition is used to ammoniate a second portion of the absorber effluent solution and thereby produce fresh absorbent solution. (Author abstract modified)

32310 **APTIC NO. 54362**

Wernicke, Hans Joachim and Hermann Reitzenstein

SULPHUR EXTRACTION PROCESS. *(Messer Griesheim G.m.b.H., Frankfurt am Main, Hanauer Landstrasse, and Uhde, Friedrich G.m.b.H., Dortmund (West Germany)) U. S. Pat. 3,666,418. 3p., May 30, 1972. 3 refs. (Appl. Aug. 17, 1970, 4 claims).*

A process for obtaining sulfur from a gas mixture containing from 2-20% hydrogen sulfide has been developed with the aid of a burner and a steam generator having a mixing chamber. The H2S-containing gas mixture is reacted with SO2 (SO2 to H2S ratio equal to 1:2) in the mixing chamber to effect the conversion of H2S to sulfur and water. A portion of the sulfur is reacted in the burner with a gaseous mixture containing oxygen and oxygen-rich gases containing at least 60% oxygen to produce the SO2. Higher sulfur yields can be achieved by the use of one or more contact furnaces connected after the steam generator. Starting gases which contain in addition to H2S other sulfur-containing gaseous components such as carbon disulfide, carbonyl sulfide, and mercaptans can also be reacted by means of the process without disadvantage or alteration. This process is similar to the improved I.G.-Claus process but allows the process to be carried out when the H2S concentration is less than 15%. The Claus process must have an H2S content of 15-20% or more.

32311 **APTIC NO. 54353**

Westlin, Karl L. and Allan R. Getzin

FILTER SUPPORT CONSTRUCTION. *(American Air Filter Co., Inc., Louisville, Ky.) U. S. Pat. 3,668,843. 3p., June 13, 1972. 7 refs. (Appl. April 6, 1970, 3 claims).*

A filter cell support and a retaining assembly for a gas separation apparatus have been designed which are straightforward and economical to manufacture and install, which occupy a minimum of space, and which require a minimum of steps for insertion and removal of a filter cell; the apparatus also readily accommodates variations which might occur in manufacturing such that a positive, uniformly applied pressure against the filter cell header frame is achieved. The device consists of a flow-through support frame and spaced, opposed channel members of U-shaped cross section which extend transversely across the support. The channel members are opened at one end to receive a filter cell header frame which is installed by sliding into the channel. The filter cell has a rectangular flow-through header, and the filter media member has its peripheral edges fastened to the header frame which is so sized that opposed sides engage by sliding into the opposed channel members of the support frame. Longitudinally extending spring members cooperate with the opposed sides of the header frame to uniformly and constantly urge the opposed sides of the header frame into sealing engagement against the inner walls of the opposed channel members of the support frame. (Author summary modified)

32312 **APTIC NO. 55084**

Winch, G. R.

DESIGN OF INCINERATORS TO COMPLY WITH CLEAN AIR CODES. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 98-106. 10 refs. (May 15-18.)*

Design factors for incineration of general refuse produced in buildings, as opposed to special wastes of industrial processes, are considered in reference to compliance with clean air codes. An incinerator must be capable of burning a range of refuse for which it is designed with minimum emission of dust and without emission of smoke and odor; it should also reduce the refuse to sterile ash which may be used immediately as an aggregate for land fill or for construction purposes. It is essential to maintain a temperature of between 800 and 900 C in a secondary combustion chamber in order to meet the low smoke emission and minimum odor requirement. The large proportion of volatile matter in refuse necessitates injection of substantial quantities of secondary and tertiary air at high velocity in order to provide the turbulence required for quick and complete burn-out. Preheated air has a considerable advantage over cold air in stimulating good combustion. Dust burden depends upon the ash content of refuse fired, and low resistance wet scrubbers at 60% efficiency and high efficiency dry cyclones at 80% efficiency will enable particulate emissions less than 0.2 and 0.1 grains/cu ft to be maintained for dust burdens of up to 0.5 grains/cu ft. Characteristics of wastes from buildings, trends in international legislation, and costs of refuse disposal for various countries are briefly reviewed since these factors are major considerations influencing the design of modern incineration plants.

32313 **APTIC NO. 54178**

Yoshimura, Toshifumi and Junichi Furukawa

PRESENT AND FUTURE OF PRACTICAL APPLICATION OF MEASURES FOR ELIMINATION OF SULFUR FROM EXHAUSTED GAS. *(Haien datsuryu jitsuyoka no genjo to kongo). Text in Japanese. Sekiyo to Sekiyu Kagaku (Petrol. Petrochem.), 16(8):26-31, Aug. 1972.*

Because of the large consumption of heavy oil, efficient desulfurization methods are needed. Desulfurization capacity in Japan is now 0.15 million bbl/day by the direct method and 0.4 million bbl/day by the indirect method, but these can only eliminate 75 and 40% of the sulfur, respectively. Dry and wet stack gas desulfurization methods are described, including the recovery of sulfur, gypsum, and other by-products.

1971

32314 **APTIC NO. 55048**

Union Carbide Corp.

MEMORANDUM ON THE STATUS OF AIR POLLUTION ABATEMENT AT MARIETTA, OHIO. *In: Economic Dislocation Resulting from Environmental Controls. 92nd Congress (Senate), First Session, Serial No. 92-H19, p. 139-146, 1971. 3 refs. (Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works.)*

GPO

The economic and technical factors involved in complying with recommendations (made by the Parkersburg, W. Va.-Marietta, Ohio Interstate Air Pollution Abatement Conference) relating to the abatement of emissions from Union Carbide s power station and ferroalloys plant at Marietta, Ohio are reported. A description is given of the two facilities and their pollution abatement equipment. The air pollution abatement recommendations related to the reduction of sulfur oxide emissions, fly ash emissions, and combustion effluents at the power station, and the reduction of particulate emissions at the ferroalloy plant. The use of wet venturi collection systems, Buffalo Forge Scrubbers, and improved methods of furnace operation have caused a reduction in the emissions of the ferroalloys plant exceeding the recommendations. The compliance program at the power station involves the use of lower sulfur coal, the construction of higher stacks, and the installation of permanent, long-term scrubbing facilities. The plant s previously installed electrostatic precipitators do not remove enough fly ash to comply with the recommendations, nor would the use of a 12% ash coal, which is potentially available to the plant. A further reduction in sulfur oxide emissions will be possible by the fourth quarter of 1974, following the installation of a new sulfur scrubbing system. While Union Carbide does not wish to curtail its production rates, this alternative may be necessary if adequate amounts of low-sulfur, low-ash coals are not available. The economic factors involved in pollution abatement are summarized.

32315 **APTIC NO. 55069**

Anthony, W. Stanley and Fred L. Shuman, Jr.

DISPOSAL OF LIQUID PESTICIDES BY INCINERATION. *Preprint, American Society of Agricultural Engineers, 13p., 1971. 4 refs. (Presented at the American Society of Agricultural Engineers, Annual Meeting, Pullman, Wash., June 27-30, 1971, Paper 71-148.)*

Pesticides can be incinerated to effectively reduce their contribution to air pollution. The primary factors involved in the incineration of a particular pesticide are: the pesticide feed rate; the excess primary combustion air; and the excess secondary combustion air. These variables were investigated over the ranges of 0.66 to 2.34 gal/hr, 36.36% to 103.64%, and 1.36% to 68.64%, respectively. A central composite rotatable experimental design was used. The carbon dioxide and sulfur dioxide concentrations in the off-gases resulting from the incineration of Malathion varied from 0.11% to 4.07% and 0.0 ppm to 56.13 ppm, respectively. The SO2 concentration was minimized at 72.60% excess primary combustion air and 28.23% excess secondary combustion air. The CO2 concentrations was minimized at 63.57% excess primary combustion air and 6.25% excess secondary combustion air. The SO2 concentration was maximized at a pesticide injection rate of 1.82 gal/hr, and the CO2 concentration was minimized at a pesticide injection rate of 2.19 gal/hr. The results indicate that incineration can be successfully utilized to dispose of left-over or unused pesticides. Further investigation is needed into the variables affecting incineration. (Author summary modified)

32316 **APTIC NO. 54733**

Gautreaux, M. F.

INFORMATION FOR THE NATIONAL RESEARCH COUNCIL CONCERNING METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL. *Preprint, Ethyl Corp., Detroit, Mich., Michigan Labs., 8p., Oct. 28, 1971. 10 refs.*

Methylcyclopentadienyl manganese tricarbonyl (MMT) is a liquid organomanganese compound which contains 25 wt% manganese. It is used as a combustion improver in boiler and turbine fuels and as an antiknock in gasoline; during the combustion of fuels containing it, it is converted to solid manganese oxide. When used in boilers and turbines, MMT can effect a significant reduction in visual smoke, sulfur trioxide, deposit formation on boiler tubes, and/or the formation of vanadium pentoxide. As an antiknock for gasoline, it can increase spark plug fouling and valve wear, although at low levels of manganese these problems are not encountered to a significant degree. In addition, low levels of manganese have no adverse effects on possible automotive emission control devices; hydrocarbon, carbon monoxide, and nitrogen oxide emissions when using manganese are comparable to those obtained with clear fuel. Currently, the atmospheric manganese contributed by MMT is very small; even if manganese were used in 50% of the U. S. gasoline at .25 g Mn/gal, the most this would add to the urban air would be 0.05 to 0.2 micrograms Mn/cu m. These levels would present no problems in terms of the rate of oxidation of the sulfur dioxide present in the air or human and animal health.

32317 **APTIC NO. 54742**

Jonke, A. A., G. J. Vogel, L. J. Anastasia, and R. L. Jarry

WORK PLAN FOR CONTINUATION OF THE PROJECT: REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION. *Argonne National Lab., Ill., Chemical Engineering Div., 44p., April 1971. 26 refs.*

NTIS: ANL-ES-CEN-1003

A work plan is presented for continuation of an investigation into use of the fluidized bed concept for lowering the flue gas emissions of sulfur dioxide, nitric oxide, and particulates which result from the combustion of fossil fuels. Additional work is planned on the antipollution aspects of fuel combustion in fluidized beds to which limestone has been added. The major emphasis of the next phase of the work will be on combustion at pressures up to 10 atm, and the regeneration of the sulfated lime under pressure. Fluidized bed combustors will be operated in the one and two-stage modes to determine the effects on emissions of sulfur and nitrogen oxides. The program will include laboratory and bench-scale work aimed at elucidating the mechanisms important to sulfur oxide and nitrogen oxide control. (Author abstract modified)

32318 **APTIC NO. 54303**

Koichi, Iinoya, Makino Kazutaka, and Fukui Yoshihiro

STUDY OF FILTER MEDIUM LIFE IN DUST COLLECTION. *(Firuta shujin ni okeru rozai no jumyo ni kan-sura kosatsu). Asahi Garasu Kogyo Gijutsu Shoreikai Kenkyu Hokoku (Res. Rep. Asahi Glass Found. Contrib. Ind. Technol.), vol. 18:35-50, 1971. 1 ref. Translated from Japanese, 21p.*

General fundamental equations were studied with respect to the question of filter medium renewal in filter dust collecting equipment. This signifies a new standpoint in filter research. Measurements of the cleaning residue fraction in bag filters were taken. It displayed rather large values (0.5-0.8) from the first cleanings and did not have a very great dependence on the number of cleanings. A model was provided for the cleaning residue fraction for filter medium renewal. In the case of bag filters, there is an optimum total period T. Numerical calculations of the fundamental equations were performed for the filtering velocity distribution and the dust load distribution for air filters of the partial filter medium renewal type. The results agree relatively well with the measures values. (Author conclusions modified)

32319 **APTIC NO. 54696**

Kozak, Michael A., R. J. Baczak, and G. K. Landrum

GET THE LEAD OUT: METHODS FOR REMOVING LEAD FROM PLANT WASTE WATER STREAMS. *Sunflower Army Ammunition Plant, Lawrence, Kansas, Hercules, Inc., Contract DA-11-173-AMC-42(A), Rept. SUN 143-10, 82p., Aug. 2, 1971. 8 refs.*

NTIS, DDC: AD 729049

A water wash system is used to collect and remove waste powder and chemicals from the processing building to nearby catch tanks. The catch tanks are relatively effective in trapping suspended solids, but other soluble contaminants are often washed into the plant s waste streams, and subsequently into the nearby water course. Precipitation of lead ions and an ion exchange process were investigated as methods for removing lead from the waste water streams. Using a resin column, a reduction of lead to a level of 0.05 ppm was accomplished by the ion exchange process. When plant effluent streams contained lead in concentrations up to 20 ppm with flow rates as high as 120 gal/min, the ion exchange method was the only process able to accommodate these conditions. An intermediate acid-chelating resin with phosphonic acid functional groups met all the requirements for lead removal. This process removed lead to concentrations well below 0.5 ppm. In the lead precipitation method, lime and ferric salts were used to treat the blender waste water. Lead removals of 75-85% were achieved to levels as low as 0.30 ppm. Overall improvement in the water quality was realized. A combination of both systems is recommended. The lead precipitate system, after removing approximately 80% lead and improving water quality, would discharge into the ion exchange process where the lead levels would be reduced to at least 0.05 ppm.

32320 **APTIC NO. 54679**

Lineberry, M. J.

NATURAL GAS POWERED AUTOMOBILES--PERFORMANCE, JUSTIFICATION, IMPACT. *Preprint, American Society for Metals, Metals Park, Ohio and Society of Manufacturing Engineers, Dearborn, Mich., 7p., 1971. 7 refs. (Presented at the Western Metal and Tool Conference and Exposition, Los Angeles, Calif., March 8-11, 1971, Paper W71-9,4.)*

The performance characteristics of an engine fueled with natural gas are essentially the same as with gasoline. However, with natural gas there is a reduction in power due to the lesser charge of fuel placed in the cylinder and to the reduction in peak cylinder pressure. This is caused by the slower flame speed of the natural gas. Also, the range of the natural gas powered vehicle is typically less than 100 miles, with the cost of conversion to natural gas being about $450 per vehicle. Natural gas operation also offers some definite operating advantages: there is no warm up period required, a more reliable state of idling is easily attained, and the phenomenon of vaporlock when driving under a heavy load on a very hot day does not occur. Further, gaseous fueled automobiles can meet the rigid Federal exhaust emission standards being proposed, while the prospect is poor for any gasoline-fueled engine doing so. The natural gas powered Caltech Clean Air Car betters the proposed Federal standards for 1980 in all categories except nitrogen oxides, missing that standard by 0.07 g/mi. With regard to cost, the significantly lower fuel costs and lower maintenance costs offered by natural gas fuel can sometimes bring about capital cost recovery in 2 to 3 years. Presently the economic situation is most advantageous for fleet operations. If every vehicle in the country were driven completely on natural gas, roughly a 27% increase in national consumption would result. However, there is no reason to believe that the supply of natural gas forms an insurmountable barrier for vehicular use. It is also possible to achieve low exhaust emissions via the steam catalytic reformation of gasoline, which converts this fuel into a mixture of methane hydrogen, and carbon dioxide.

32321 **APTIC NO. 55011**

Murthy, M. S. and S. S. Lokras

AIR POLLUTION BY SULPHUR DIOXIDE. *Chem. Process Eng., 1971:43-45, Aug. 1971. 16 refs.*

The harmful effects of sulfur dioxide, SO2 emission, and the methods of recovery and control are discussed with special reference in conditions in India. Sulfur dioxide of the order of 10 ppm and above will produce some degree of eye, nose, and throat irritation. Sulfur dioxide when dispersed in the atmosphere is oxidized to sulfur trioxide which is more toxic than SO2. Sulfur dioxide pollution results mainly from the burning of coal and oil, refining, of petroleum, smelting of ores containing sulfur and manufacture of sulfuric acid. The total emission of SO2 released in the Indian atmosphere is nearly 3.8 million tons. The possible methods that could be empolyed to control the SO2 pollution include: selection of fuels with low S content; removal of S present in fuels; discharging flue gases at high levels to ensure proper dispersion into the atmosphere; removal of SO2 from the combustion gases by absorption in liquids; treatment with aromatic amines; treatment with ammonia and ammonium salts; and treatment with lime and/or limestone.

32322 **APTIC NO. 54661**

Starkman, Ernest S.

PROGRAM FOR DEVELOPMENT OF ELECTRICALLY POWERED VEHICLES. *Preprint, American Society for Metals and Society of Manufacturing Engineers, 20p., 1971. 4 refs. (Presented at Western Metal and Tool Conference and Exposition, Los Angeles, Calif., March 8-11, 1971, Paper W71-9,3.)*

In considering battery powered vehicular propulsion, the following criteria are of importance: specific power, specific energy, cost, cycle life, voltage, and working temperature. For a 2000 pound vehicle (including payload), of which 500 lbs consist of batteries and associated electric gear, 26 kw are required for propulsion at 70 mph on a level road, and 50 kw are required for marginal participation on a freeway of superhighway. This vehicle will require an energy density of 25 w-hr/lb for 50 mi of range; for a given power and energy density, the range is significantly reduced under conditions requiring departures from a constant speed. In terms of battery performance, high levels of power demand are to be avoided if maximum energy or vehicle range is to be obtained. A vehicle equipped with the best lead-acid batteries presently available is limited to roughly 50 mi of range at 30 mph; range can be increased by going slower and lost by traveling faster. Although more expensive batteries will provide greater range and performance, the performance afforded by the best and most expensive silver-zinc battery is short of that afforded by the subcompact, 1971 gasoline engine. The future development of battery systems such as sodium-sulfur and lithium-chloride will provide range and performance which will be reasonably competitive with that of the gasoline engine. Basically, however, no existing power plant can compete with the internal combustion engine for both power and range. A competitive battery powered vehicle will require approximately the same amount of fuel to be consumed at a central power station as existing gasoline vehicles presently consume in accomplishing the same function.

32323 **APTIC NO. 54731**

Vasilescu, Calin Adrian and Nicolae Stoica

THE EFFECT OF THE COMBUSTION CHAMBER SHAPE ON THE CONCENTRATION OF POLLUTANTS IN EXHAUST GAS FROM INTERNAL COMBUSTION ENGINES. *(L influence de la forme de la*

chambre de combustion sur la concentration des produits polluants dans les gaz d echappement des moteurs a allumage par etincelle). Text in French. Rev. Roumaine Sci. Tech. Ser. Electrotech. Energet., 16(2):337-352, 1971. 5 refs.

Hydrocarbons in exhaust gases result from the cooling of incompletely burned combustion gas on combustion chamber walls. Hydrocarbon production increases with extended combustion time, by prolonged movement of the mix through the chamber, and by large combustion chamber surfaces. In the case of carbon monoxide a combustion chamber shape widening towards the spark plug will yield lower CO concentration in exhaust gas because a larger volume of the combustion gas will be exposed to high temperatures, and the combustion process will proceed until the chemical equilibrium is reached. The concentration of nitrogen oxides in exhaust gases will be lower if the volume of gases burning initially is as small as possible because then high temperature prevails at which the NOx content at the point of chemical equilibrium is high. The content of lead compounds in exhaust gas can be influenced by the shape of the combustion chamber only indirectly. Sulfur compounds in exhaust gases are attributable solely to the sulfur content level in gasoline. An analysis of the processes which produce pollutants seems to indicate that extended combustion duration reduces their volume because chemical reactions taking place have time to run to completion. As for the movement of gases in the cylinder and the distribution of the gas volume in the combustion chamber, the tendency is the same for all pollutants. Cooling conditions are different for different pollutants but this factor affects mainly the hydrocarbon content in exhaust gases. The effect of compression on combustion velocity is a factor of no great importance especially for hydrocarbons. The construction of the combustion chamber which results in the smallest emission of pollutants is not identical with the construction of the chamber which gives best engine performance.

32324 **APTIC NO. 54991**

Woerner, Alfred, Gerd Duembgen, Heinrich Sperber, Hans Haas, and Otto Grabowsky

ABSORPTION OF FORMALDEHYDE FROM GASES CONTAINING IT. *(Badische Anilin- and Soda-Fabrik A. G., Ludwigshafen (West Germany)) U. S. Pat. 3,606,732. 5p., Sept. 21, 1971. 2 refs. (Appl. Nov. 4, 1968, 3 claims).*

An improved process for the absorption of formaldehyde from a gas containing formaldehyde (obtained in the dehydrogenation-oxidation of methanol over silver catalysts) has been developed so all of the formaldehyde is recovered from the synthesis gas and the formaldehyde solution obtained as the end product has only a low content of methyl alcohol. The reaction gas is passed successively through at least three absorption stages at temperatures of 60 to 95 C and is contacted in each of the stages from the first to the penultimate with an aqueous solution of a urea-formaldehyde precondensate prepared from an aqueous urea-formaldehyde solution with a molar ratio of formaldehyde to urea of from 1.8 to 2.8 by condensation at a pH of 4 to 6.5 and a temperature of from 60 to 95 C followed by neutralization to pH 6 to 7. The gas is contacted with an aqueous urea solution in the last stage.

1970

32325 **APTIC NO. 54285**

Bagnulo, A. H., John W. Bishop, Shelton Ehrlich, and Ernest B. Robison

DEVELOPMENT OF COAL FIRED FLUIDIZED-BED BOILERS. VOLUME I. (FINAL REPORT). *Perathon Inc., Alexandria, Va., Pope, Evans and Robbins Div., Office of Coal Research Contract 14-01-0001-478, Rept. 36, 212p., 1970.*

GPO

Pollutant emissions from the combustion of coal in a fluidized bed were monitored during a project on the development of coal-fired fluidized bed boilers. Efforts were made to reduce sulfur emissions by the injection of limestone based sorbents into the bed and to determine the conditions most favorable for the reduction. The major test variables and ranges were: medium and high sulfur coal (2.6% and 4.5% S); 1500 to 1900 F bed temperature; 6-20 in. bed depth; sintered ash and limestone bed material; flue gas oxygen content of 0.5-5%; superficial gas velocity of 6-14 ft/sec; BCR 1337 dolomite and BCR 1359 limestone absorbents; -7 to -325 mesh absorbent size; full fly ash recirculation; and pneumatic method of sorbent feed. Emissions of sulfur dioxide, nitric oxide, and hydrocarbons were monitored continuously, with periodic samples taken for determination of other oxides of sulfur and nitrogen. A newly constructed fluidized bed column adequately instrumented, was used as the basic test unit. When conditions most favorable for air pollution control were established in this upgraded fluidized bed, the conditions were reproduced in tests conducted in the fluidized bed boiler module. (Author summary modified)

32326 **APTIC NO. 55033**

Baron, Gerhard, Ernst Kapp, Heribert Dernbach, Franz Bieger, and Rudolf Kohlen

PRODUCTION OF CARBON MONOXIDE AND HYDROGEN. *(Metallgesellschaft Aktiengesellschaft, Frankfurt am Main and Ruhrgas Aktiengesellschaft, Essen (West Germany)) U. S. Pat. 3,540,867. 8p., Nov. 17, 1970. 4 refs. (Appl. May 10, 1967, 10 claims).*

A process for producing, in the coking or gasification of coal, a gas consisting predominantly of carbon monoxide and hydrogen has been developed to significantly reduce by-product formation. Tar-containing gas coming from the coking or gasification is cooled directly or indirectly to temperatures above 180 C and freed of dust and condensing substances. It is then enriched with water vapor and heated to about 400 to 550 C. After the addition of oxygen, it is dissociated at temperatures above 700 C on a cleavage catalyst on high-temperature-resistant supporting material. Carbon dioxide, sulfur compounds, and ammonia are suitably washed out of the product gas in a conventional manner from the cleavage gas that is cooled by heat exchange with the raw gas being dissociated. Carbon dioxide may be added to the raw gas being dissociated, in addition to the oxygen. Volatile hydrocarbons may also be added to the hot, raw gas when it is being cooled for the separation of dust and heavy tar, or when it is being heated prior to catalytic dissociation.

32327 **APTIC NO. 54275**

Castellucci, Nicholas T.

TOWER PACKING ELEMENT. *(Pittsburgh Corning Corp., Pa.) U. S. Pat. 3,493,218. 8p., Feb. 3, 1970. 8 refs. (Appl. May 7, 1968, 8 claims).*

A cellular ceramic tower packing element has been developed with improved separating power by increasing the accessible surface area of the element. The packing element is generally spherical in shape and has an irregular, textured external surface which increases the accessible surface area for the phase interaction of the fluids during the gas-liquid contacting operation. The irregular, textured surface may be obtained by milling or abrading a cellular ceramic nodule until the continuous outer skin and a portion the layer of underlying closed cells are removed. The milling or abrading of the cellular ceramic nodule ruptures or opens the individual cells in the layer beneath the outer skin. The surface of the tower packing element then comprises the inner surface of the opened and exposed cells to provide an irregular, textured exterior surface with each exposed cell cavity forming a recessed portion or micro-cup in the tower packing element exterior surface. (Author summary modified)

32328 APTIC NO. 55851

Corder, Stanley E., George H. Atherton, Paul E. Hyde, and Russell W. Bonlie

WOOD AND BARK RESIDUE DISPOSAL IN WIGWAM BURNERS. *Oregon State Univ., Corvallis, Ore., Forest Research Lab., Paper 720, Bulletin 11, 70p., March 1970. 31 refs.*

The wigwam burner was evaluated as a means of disposal for wood and bark waste, and alternatives for both utilization and disposal were investigated. There were 376 wigwam burners operating at Oregon forest industries in 1968. Wood and bark residue disposed of in these burners amounted to nearly 3 million tons (dry weight) in 1967. Observations were made at many operating wigwam burners to note which operational features gave least smoke and air pollutants. Consultants also made recommendations for improved burner operation and assembled cost information for off-the-shelf gas cleaning equipment that might be applied to wigwam burners. A wigwam burner of 40-foot diameter was modified to include a forced draft underfire and overfire air system and natural gas burners. A damper at the top of the wigwam burner was subsequently added. Tests were conducted with the modified burner, and results indicated regulations for air pollution control were generally met when temperatures of the burner exhaust were greater than 700 F. Such temperatures could be achieved by feeding Douglas fir and western hemlock bark at rates greater than 2 tons (dry weight) per hr (without a top damper), if there was effective control of both underfire and overfire air flow, and if auxiliary gas burners were on while starting. Recommendations are made for improvement of burner operation and information is presented on cost of modification. A discussion on design of wigwam burners is also included. (Author summary modified)

32329 APTIC NO. 54278

Eckert, John S.

VALVE TRAY. *(Norton Co., State of Mass.) U. S. Pat. 3,491,987. 4p., Jan. 27, 1970. 4 refs. (Appl. Nov. 3, 1967, 2 claims).*

A valve tray for gas and liquid contact devices has been designed to inhibit rotation of the valves and to minimize the weeping phenomenon. The tray has several apertures and valves associated with each aperture. The valve means is movable under the influence of gas flow from a closed position (sealed engagement with the tray) to an open position (disengagement from the tray); and a rigid structural interconnect is positioned between at least two adjacent valves on the upstream side. The structural interconnect serves the function of preventing rotation of the valves and thereby increases the useful life while maintaining maximum efficiency of the tray. Additionally, the interconnect serves to add mass to the upstream side of the valve thus causing that portion of the valve to lag in its response to increasing gas velocities. The latter action is responsible for holding the weeping phenomenon to a minumum.

32330 APTIC NO. 55088

Faber, John H. and Philip G. Meikle

ASH UTILIZATION TECHNIQUES PRESENT AND FUTURE. *Bureau of Mines and IIT Research Inst., Proc, Miner. Waste Util. Symp., 2nd, Chicago, Ill., p. 24-30. 15 refs. (March 18-19.)*

Of the over 30 million tons of ash produced annually by the U. S. during the burning of bituminous coal and lignite, approximately 10% of the fly ash and 33% of the bottom ashes are utilized in the manufacture of cement, concrete and concrete products, construction fill, road-base and soil stabilization, lightweight aggregate, and mineral filler for asphaltic pavement. Miscellaneous uses for ash include oil-well grouting, foundry core sand, filler in plastics and chemicals, blasting grit, and ice control. Although these utilization practices will probably continue to grow, new markets must be developed for the increasing amounts of ash which will be produced in coming years. Raw and beneficiated ash processing can be used to make lightweight aggregate, brick, and aerated concrete. Other promising applications would provide for the use of ash as soil for crops and filler material for old mines; it also may be useful in improving acid soils, treating various types of polluted water and sewage, dewatering biological sludges or sewage treatment wastes, and neutralizing synthetic and actual acid mine drainage waters. Great Britain and several other western European countries have met with more success in marketing their ash output. About 40% of Britain's ash is sold as load bearing fill, block and brick, lightweight aggregate, pozzolanic admixture for concrete, floater material to reduce evaporation and absorb heat from reservoirs, and a free-floating powder to sink crude oil. The utilization of fly ash will not only help to solve an important solid waste problem, it can result in considerable economies for utility companies; disposal costs will be obviated and income will be provided from ash sales.

32331 APTIC NO. 54654

Flebu, Rolf Johan

DUST ARRESTOR. *(Assignee not given.) U. S. Pat. 3,514,924. 4p., June 2, 1970. 9 refs. (Appl. Aug. 20, 1969, 6 claims).*

A dust arrestor for washing dust-containing air has been developed with improved means for controlling the air velocity, the amount of water pickup, and the resultant centrifugal force on the water droplets. The apparatus consists of a cylindrical wash chamber having a water reservoir defined within the bottom of the chamber and providing an air contacting water surface. An air nozzle is positioned adjacent, but separated from, the air contacting surface and is so oriented to provide an air stream moving about the interior periphery of the chamber initially in a direction away from the air contacting surface. A second air contacting water surface may be provided exterior to the chamber adjacent the nozzle to provide from preliminary cleansing of the air. An adjustable baffle member is rotatably mounted and has an upwardly facing surface situated within the chamber between the nozzle and the interior air contacting surface; it also has a lateral surface which partially defines the nozzle. Adjustment of the baffle member position alters the inclination of the surface facing upward and also controls the cross-sectional area of the nozzle. (Author summary modified)

32332 APTIC NO. 54258

Garscia, E.

AIR PROTECTION IN THE LENIN STEELWORKS. *(Ochrona powietrza atmosferycznego w hucie im. Lenina). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(3(17)): 49-62, 1970.*

NTIS: TT 70551243

New air pollution control measures instituted at the Lenin steelworks are described. Modern dust collecting systems were installed at the new boilers of the power station (electrostatic precipitators), in the ingot mold foundry (foam washers), in the converter plant (venturi nozzles and foam washers), and in the dolomite plant no. 2 (cyclones and electrofilters). Past and present control measures are described, and future planning in research, technology, and legislation are outlined.

32333 APTIC NO. 54254

Laskowski, W.

A FERRITE ELECTRODE FOR ELECTROSTATIC PRECIPITATORS. *(Electroda ferrytowa dia elektrofiltrow). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4(18)):50-57, 1970. 11 refs.*

NTIS: TT 7055124/4

Experiments to increase the precipitating efficiency of an industrial carbon-steel discharge electrode of an electric precipitator are discussed. This cathode is prepared in a single thermal treatment by coating its surface with ferrite. Round or barbed-wire discharge electrodes of carbon steel can be activated by thermal treatment. This activation process can be effected by passing the electrode through a mixture of calcium, strontium, or barium oxide heated to a temperatue of 100 C with no access of oxygen to the reaction volume. Alkaline earths are suitable for the activation of electrodes. Every kind of steel electrode has its individual optimum activation time. The activated steel barbed-wire electrodes exhibit an appreciable increase in emissivity at a constant voltage applied, and under the conditions of the experiment, improve the efficiency of the electrostatic precipitator. (Author conclusions modified)

32334 **APTIC NO. 54273**

Marenghi, Michael and Barry James Taylor

GAS-LIQUID CONTACT APPARATUS. *(Alcan Research and Development, Ltd, Ottawa, Ontario (Canada)) U. S. Pat. 3,495,813. 6p., Feb. 17, 1970. 3 refs. (Appl. Dec. 26, 1967, 8 claims).*

A gas-liquid contact apparatus for use in a subhalide process for the refining of aluminum has been developed with improved contact efficiency by the production of very fine droplets and the uniform distribution of such droplets throughout the gas space, particularly that portion close to the screw-lifts. A high temperature gas stream containing aluminum monohalide is led into a first stage chamber and subsequently to succeeding identical stages. The gas which enters through a passageway at the end of the chamber most distant from the screw-lifts is met by essentially countercurrent and relatively cool sprayed molten metal. The gas is somewhat cooled and partially decomposed to yield its aluminum to this portion of the chamber. As the gas approaches the immediate vicinity of the screw-lifts, the direction of spray generally changes from countercurrent to crosscurrent, and the spray becomes more intense and concentrated. The effect of this action is to scrub the gas thoroughly and expose all portions to metallic contact.

32335 **APTIC NO. 54657**

Meek, George W.

GAS AND LIQUID CONTACT APPARATUS. *(Carl Munters and Co., Stocksund (Sweden)) U. S. Pat. 3,500,615. 6p., March 17, 1970. 29 refs. (Appl. July 7, 1967, 3 claims).*

A gas and liquid contact apparatus has been designed with a drift eliminator which has improved efficiency in precluding loss of water from the casing through the air discharge outlet with a minimum of pressure drop in the air stream. The drift eliminator is mounted above the fill of the apparatus and extends over its entire cross sectional area. It consists of at least two relatively thin sections or slices which are formed of several facially opposed corrugated strips disposed in parallel relationship; the corrugations of adjacent sheets cross one another. The resultant structure forms a mass of intersecting and intercommunicating passages allowing gas and liquid to pass through. The strips are on the order of a few tenths of a mm in thickness and are preferably made of cellulose fiber material or an inorganic such as asbestos or plastic. The corrugations incline at a 30 deg angle to vertical, preferably. Though the strips in each of the slices are arranged in parallel direction, the strips of one slice extend at a 90 deg angle to the strips of another slice. This invention relates to cooling towers and scrubbers.

32336 **APTIC NO. 54663**

Mikula, K. and J. Liszka

THEORY AND PRACTICE OF APPLYING THE WOS-TYPE DUST COLLECTOR. *(Teoria i praktyka zastosowania odpylacza typu WOS). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(3):19-33, 1970. 12 refs.*

NTIS: TT 70-55124-3

The theory and practice of applying the WOS type dust collecting fan are described. The prototype of the device was combined with the heating boiler WLM-2.5, the mean efficiency of dust collection from waste gases amounting to 96 + or %. Previous studies are reviewed synthetically, and the final formulas are quoted which relate the size of the collected dust particle with the constructional and operational parameters of the device. Constructional solutions are presented, and nomographs for selecting the proper size of the device are given. Overall dimensions of the device and examples of its installation are also given. (Author abstract modified)

32337 **APTIC NO. 55159**

Motohiro, Terushige

STUDIES ON THE PREVENTION OF OFFENSIVE ODOUR FROM FISH PROCESSING PLANTS. V. UTILIZATION OF ASBESTOS-CEMENT SHEETS IN WATER- SCRUBBER. *(Suisan toshi ni okeru kakojo yori no taiki osen busshitsu no haijo taisaku ni kansuru kenkyu, daigoho: suisen to asubesuto-ban no heiyo ni yoru joshu kika. Text in Japanese. Hokkaido Daigaku Suisan Gakubu Kenkyu Iho (Bull. Hokkaido Univ. Fac. Fisheries), 21(1):27-31, 1970. 6 refs.*

Asbestos-cement sheets were introduced into a water scrubber in order to reduce noxious odors resulting from a fish processing plant. Odor concentration decreased from between 240 to 1800 to 10 when sufficiently large volumes of water were used for washing. Adsorption and gas scrubbing when the asbestos-cement sheets are incorporated into the scrubber give these results.

32338 **APTIC NO. 55160**

Motohiro, Terushige and Kenji Kato

STUDIES ON THE PREVENTION OF OFFENSIVE ODOUR FROM FISH PROCESSING PLANTS. VI. CHLORINATION OF THE ODOUROUS GAS IN WATER-SCRUBBER. *(Suisan toshi ni okeru kakojo yori no taiki osen busshitsu no haijo taisaku ni kansuru kenkyu, dairoppo: enso shoriho no koka). Text in Japanese. Hokkaido Daigaku Suisan Gukubu Kenkyu Iho (Bull. Hokkaido Univ. Fac. Fisheries), 21(1):32-35, 1970. 4 refs.*

The effect of chlorine in water scrubbing upon the removal of odorous effluent gas from a fish processing firm was investigated. A linear relationship existed between the odor concentration of the original gas and that of the Cl2 treated gas. The odor of the gas gradually disappeared with increasing Cl2 concentrations, and an odor concentration of 220 was successfully removed by introduction of 3.0 ppm Cl2. An odor concentration of 1080 was successfully reduced to 70 and 10 upon treatment with scrubbing and chlorination, respectively. Chlorine levels above 3.0 ppm yielded products that were more offensive than the original odor.

32339 **APTIC NO. 54277**

Osdor, Asriel

APPARATUS FOR PROVIDING LARGE SURFACE AREA DIRECT CONTACT BETWEEN A LIQUID AND ANOTHER FLUID. *(Hydro Chemical and Mineral Corp., New York) U. S. Pat. 3,496,996. 9p., Feb. 24, 1970. 2 refs. (Appl. July 5, 1968, 13 claims).*

An apparatus for providing improved direct contact between a wetting liquid and one or more other fluids (non-wetting fluids) has been designed for a variety of applications, including liquid-gas absorption processes. The device includes inlets and outlets for both the wetting liquid and the other fluid. Several vertically-extending, horizontally-spaced guide elements, each having two or more vertical guide surfaces wettable by the wetting liquid are positioned within the unit s chamber. Each of the guide surfaces faces and projects in a horizontal direction toward a guide surface of an adjacent guide element so that the spacing between the surfaces of adjacent elements is the minimum spacing between such elements. The wetting liquid is directed from its inlet to the guide elements to form vertically flowing bridging films, each film having two free faces and bridging a pair of adjacent guide surfaces. Thus, the wetting liquid is used to form several conduits for the other fluid or fluids. A part of the wall section of the conduit is formed by the bridging films of wetting liquid which have two free faces for contact with the non-wetting fluid, thus permitting very large direct contact surface between one liquid and the other fluid per unit weight of the guide elements.

32340 **APTIC NO. 54655**

Starbuck, Herman S. and Neal Brooks

TOWER PACKING UNIT. *(United Air Specialists, Inc., Cleveland, Ohio) U. S. Pat. 3,506,248. 7p., April 14, 1970. 11 refs. (Appl. Feb. 21, 1968, 5 claims).*

An improved tower packing unit of polyvinyl chloride which is useful in various processes including the mixing or separation of gases and liquids has been developed to be light in weight yet to have the structural strength needed to avoid collapse or breakage. The unit presents maximum wettable surface area per unit volume; and, when dump-loaded into a reactor chamber, the unit affords a great number of fluid-flow direction changes at a minimum pressure drop. The packing unit consists of a rigid plastic body having a thin open-ended outer tubular wall with a central axis, a thin open-ended inner tubular wall concentric with the outer wall, and several thin radial connecting fins extending between the inner and outer walls. The fins serve to space the inner and outer wall and to provide passageways for fluid entering and leaving the open ends of the walls. The walls are imperforate to gas-liquid contact surfaces for mass transfer of gas or liquid passed through the tubes and are of different length dimensions in the direction of the central axis.

1969

32341 **APTIC NO. 54707**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany)

EMISSION CONTROL IN HARD COAL CAKE MANUFACTURING PLANTS. *(Auswurfbegrenzung. Steinkohlen-Brikettfabriken). Text in German. VDI (Ver. Deut. Ingr.) Richtlinien, no. 2292:1-8, June 1969. 10 refs.*

Problems and possibilities of emission control from hard coal briquetting plants are described. Washed coal grains are dried with drier gases which retain coal particles to be separated later in dust separators. Dust formation, possible anywhere where coal granules are handled, is dependent on such factors as water content, granulometry, and strength of the particles, as well as the specific technological process adopted. The vapors from the drier, the dust-loaded vent air, and other dust-containing vapors are captured by separate systems for dust separation. Centrifugal dust separators for coarse dust, and electrostatic or wet type dust separators for fine dusts are used. Wet type dust separators are use/ only if recycling of the sludgy obtained is possible. Dust separation from briquetting press-generated waste gases is possible by means of vacuum chambers. In new briquetting plants, it is possible to limit the dust concentrations in vapors, vent air, and waste gases to 0.15 g/N cu m.

32342 **APTIC NO. 54828**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany)

EMISSION CONTROL IN HARD COAL PREPARATION PLANTS. *(Auswurfbegrenzung. Aufbereitungsanlagen fuer Steinkohlen). Text in German. VDI (Ver. Deut. Ingr.) Richtlinien, no. 2293:1-7, Aug. 1969. 10 refs.*

Problems of coal dust separation from vent air, waste gas, and sifting air in coal preparation plants are described. Dust emissions are generated during material handling, sifting, crushing, drying, and other, preparation-related operations. Tissue filters or wet type dust separators, often with centrifugal dust separator as a first stage, are used for the removal of coal dust particles from exhausted vent air. Centrifugal dust separators are used for the purification of coal dust-loaded sifting air. Fine dust particles can be separated from vent air by such equipment. Coarse dust from drier gases can be separated by means of centrifugal dust separators, while electrostatic precipitators or wet type dust separators are used for the removal of fine dust from drier gases and vapors. In new coal preparation plants, it is possible to limit the dust concentrations in vent air, sifting air, and vapors to 0.15 g/N cu m.

32343 **APTIC NO. 54261**

Fron, Z.

ANALYSIS OF THE QUALITY OF CYCLONES USED IN POLAND. *(Analiza jakosci stosowanych w cyklonow). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(4(12)):16-36, 1969. 11 refs.*

NTIS: TT 7055123/4

The different types of cyclones used in Poland are described and analyzed. Criteria are given which allow the selection of a suitable design for definite conditions, including efficiency and economy.

32344 **APTIC NO. 54737**

Kaiser, Elmer R.

INCINERATION OF PACKAGING WASTES WITH MINIMAL AIR POLLUTION. *Proc. Nat. Conf. Packaging Wastes, 1st, San Francisco, Calif., 1969, p. 181-190. 11 refs. (Sept. 22-24.)*

GPO

The consumption of packaging material in the United States is increasing rapidly, with about 90% being discarded as waste. Packaging waste has a low moisture content and high calorific value, which render it a desirable component of incinerator charges. Paper, steel cans, wood, and plastics are readily accepted by incinerator operators, although the chlorinated hydrocarbon plastics may present a problem in the form of hydrochloric acid vapor; aluminum cans and glass bottles do not present a serious problem, especially with good incinerator design and careful operation. A combustion efficiency of 92 to 93% can be achieved with mixed packaging wastes, the residue consisting of glass, metal, ash, and unburned carbon. To control air pollution from the incineration of such wastes, a gas temperature of at least 1500 F is desirable; gas burners are used to achieve such temperatures. Particles of ash and dust can be removed with electrostatic precipitators and gas scrubbers, while wet scrubbers can be used to clean the flue gases. To prevent the scrubber water from becoming too acidic, fresh water and neutralizers are added to it continuously. The high cost of refuse hauling has favored the use of on-site incinerators in commercial and industrial establishments. The greatest efficiency from such units is obtained when the refuse is charged systematically and in moderate amounts. Further development in the application of air controls and nozzles, auxiliary fuel burners, temperature regulators, and allied equipment will reduce the emission of smoke and unburned combustible gases. Improvements in the sizing and design of secondary combustion chambers will foster more complete combustion, while better training for incinerator operators will help to further reduce pollution. Scrubbers lined with rubber or polyvinyl chloride will resist the attack of the hydrochloric acid vapor formed during the combustion of chlorinated plastics.

1968

32345 **APTIC NO. 54272**

Baker, Robert A. and Robert C. Doerr

PREREDUCED CUPRIC OXIDE-COBALTIC OXIDE REDOX CATALYSTS. *(International Copper Research Association Inc.) U. S. Pat. 3,398,101. 5p., Aug. 20, 1968. 12 refs. (Appl. Nov. 22, 1963, 1 claim).*

A cupric oxide-cobaltic oxide redox catalyst has been developed which is especially effective in the treatment of internal combustion engine exhaust pollutants such as carbon monoxide, hydrocarbons, and oxides of nitrogen. The ratio of the oxides in the catalytic composition is one part of cobaltic oxide to about 3 to 35 parts of cupric oxide by weight. The catalytic carrier is preferably aluminum hydroxide, though silica, alumina, and carborundum are also satisfactory. Conventional methods for preparing the catalyst may be used, and the catalyst prepared can be a homogeneous mixture in the form of an unsupported catalyst or a heterogeneous mixture in the form of a supported catalyst. The amount of catalytic carrier in the composition can be varied within a broad range depending on a number of variables such as the ratio of oxides in the catalyst, the carrier used, and the desired physical characteristics of the catalyst. A suitable composition for a homogeneous unsupported catalyst using aluminum hydroxide as the catalytic carrier is 15% by weight of cobaltic oxide, 50 to 70% by weight of cupric oxide, and the balance consisting of the carrier. The catalyst is pre-treated in an atmosphere of carbon monoxide for about 8 hour at 450 to 500 C and has an effective life for catalytic reduction of nitrogen oxide of more than 350 hr at a temperature above 450 C.

32346 **APTIC NO. 54673**

Coxon, Peter

PROFIT BY SINTERING YOUR FLY ASH. *Power Engineering, 72(4):52-54, April 1968.*

About 10 million tons of fly ash are produced annually in the U. K., and about 20 million tons are being produced in the U. S. These figures may reach 12 million tons and 20 million tons, respectively, within the next decade. A large part of this could be economically converted into building bricks containing up to 80% fly ash, thus supplying a steady outlet for large quantities of fly ash and reducing inroads into natural resources of stone and sand. Since 1957, eight commercial-size fly ash sintering plants have been started in England and the United States. Most of these operations were unsuccessful because the fineness and carbon content of fly ash vary considerably and this fact was not taken into account. However, equipment to smooth out the variations was installed in the two latest British plants in Tilbury and Rugeley. Both plants are operating at designed output and have required little subsequent developmental work. The cost of sintering ash varies appreciably, and the capital cost for a medium sized plant runs about $5.50/cu yd/yr. Depreciation of capital is one of the biggest items of operating costs, the others being fuel and power. The running cost of sintering generally compares favorably with that of ash disposal. Based on present economics, a sinter plant is unlikely to be a viable private enterprise in the U. K. for outputs below 80,000 tons/yr on a continuous shift basis. If sintering is planned at the start, as a normal means of ash disposal, income from the sale of the sintered product would show ash disposal as a credit instead of a debit item.

1967

32347 **APTIC NO. 54826**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany)

EMISSION CONTROL IN BROWN COAL CAKE MANUFACTURING PLANTS. *(Auswurfbegrenzung. Braunkohlen-Brikettfabriken). Text in German. VDI (Ver. Deut. Ing.) Richtlinien, no. 2294:1-7, Dec. 1967. 7 refs.*

Possibilities of coal dust emission control during coal milling, drying, cooling, and pressing operations in brown coal briquetting plants are described. Dust-loaded air is generated usually everywhere in brown coal briquetting plants where material is handled, transferred, cooled, dried, and pressed. Drier vapors and vent air constitute 85-90% of the total coal dust emission, while cooling air and press die air make up the remaining 10-15%. Drier vapors are dedusted by electrostatic precipitators in vertical layout. Dry type centrifugal dust separators are used for the removal of coal dust from vent air. Dry type centrifugal separators with a wet type separator as a secondary stage are used for the dust removal from press air. In new brown coal preparation plants, it is possible to limit the coal dust concentrations in drier vapors, vent air, cooling air, and press air to 150 mg/N cu m.

32348 **APTIC NO. 54716**

Mathieu, P.

EXTRACTION OF SULFUR FROM A GAS CONTAINING HYDROGEN SULFIDE BY REACTION WITH SULFUR DIOXIDE IN AQUEOUS MEDIUM. *(Extraction du soufre d un gaz contenant de l hydrogene sulfure par reaction avec l anhydride sulfureux en milieu aqueux). Text in French. Ann. Genie Chim., no 3:107-115, 1967. 7 refs. (Presented at Congres International du Soufre, Toulouse, France, 1967.) (Translation also available from National Translation Center as 72-15031-07A).*

The reaction between hydrogen sulfide and sulfur dioxide in an aqueous medium was studied to obtain elemental sulfur with good sedimentation characteristics, and to limit secondary reactions. The reaction was $2(H_2S)$ plus SO_2 equals $3(S)$ plus $2(H_2O)$. The gas was mixed during the flow and introduced into a cylinder reactor with a 2 l capacity, supplied with a mixing system and cooler. The temperature of the medium and the shaking were regulated and the gas had a given flow of 50 l/hr. Hydrogen sulfide and SO_2 were introduced in proportions of 30% and 5%, respectively. Maximum value was reached after 100 min. Desulfurization was determined by dosing the H_2S in the gas at entering and leaving the reactor. The parameters of the reaction were studied in three different aqueous media, including distilled water; distilled water with 3.5% sodium chloride, and sea water. The desulfurization efficiency was 87.5%; the recuperation efficiency, 93%; the total efficiency, 81.3%; soluble sulfur 6.15%, and the actual efficiency of the operation was 72%. An optimum temperature of 55 C was found, and it was discovered tha sea water is a convenient reaction medium. If the water is recycled, however, the accumulation of polythionic acids has a deleterious effect on the S sedimentation. (Author abstract modified)

32349 **APTIC NO. 54739**

Millward, Richard S. and W. Allen Darby

SLUDGE DISPOSAL BY DEWATERING AND COMBUSTION. *Water Wastes Eng., p. 64-67, Oct. 1967. 11 refs.*

With Dorr-Oliver s FS (FluoSolids) sewage sludge disposal system, dewatered, degritted, and thickened sludge is injected directly into a preheated bed of fluidized hot silica: auxiliary fuel, if necessary, is also injected directly into the expanded bed. Drying and complete combustion are accomplished instantaneously, with the inert ash end product being stripped from the bed by upward moving hot gases and carried out of the reactor. These gases are scrubbed and emitted to the atmosphere at a rate of 0.050 grains per scf at 12% carbon dioxide. The ash from the underflow of the scrubbing unit can be handled in a settling basin or concentrated in a hydrocyclone. No odor results when the system operates at a minimum of 1400 F exit temperature. The FS disposal system can be either automatically or manually controlled; the automatic controls are primarily associated with fuel and air input. This system offers two significant advantages: intimate contact between fuel and oxygen is achieved without the incorporation of a mechanical mixing device; and the efficiency of the operation allows savings on auxiliary fuel. Auxiliary fuel may be further reduced by using the hot gases from the process to preheat the fluidizing and combustion air. While intermittent burning, as practiced by relatively small operations, has economic disadvantages, current FS models minimize these problems by reducing temperatures loss during down time.

32350 **APTIC NO. 54438**

Pearsall, Thomas J.

AMMONIA APPLICATION TO RECIPROCATING ENGINES. (FINAL TECHNICAL REPORT). (VOLUME I). *Continental Aviation and Engineering Corp., Detroit, Mich., Detroit Arsenal Contract DA-20-113-AMC-05553(T), CAE Rept. 1054, 120p., May 1967. 8 refs.*

NTIS, DDC: AD 706856

Two engines, one a naturally aspirated spark ignition and one a supercharged compression ignition (diesel), were successfully converted to operate with anhydrous ammonia as a fuel in lieu of the normally used hydrocarbon fuel. Conversion of the spark ignition engine required an increase of compression ratio, the provision of an ammonia carburetor, a high energy ignition source (magneto), and long reach spark plugs. A maximum of 41/hp on NH3 alone and 53 hp on NH3 plus 1.5% hydrogen was obtained. Two versions of the compression ignition engine were produced, the first achieved by introducing ammonia vapor in the induction air system and using the fuel injection system to furnish a pilot charge for ignition purposes. This engine was able to produce 132% of diesel fuel output while operating within the same limits of exhaust gas temperature and peak cylinder pressures. The second version converted the compression ignition engine to a spark ignition arrangement by removing the fuel injection pump to install a magneto, removing the fuel injection nozzles to install long reach spark plugs, and providing for aspiration of ammonia vapor into the induction air system. Performance with the spark ignition conversion exceeded that with the pilot fuel. Anhydrous NH3 has no deleterious effects on engine components except for parts made of copper, brass, or bronze. Ammonia is safe to handle. The NH3 in the exhaust of low-compression spark ignition engines resulting from partial burning at misfiring is not considered a problem. (Author summary modified)

1965

32351 **APTIC NO. 55000**

Sohr, William H., Robert Ott, and Orris E. Albertson

FLUIDIZED SEWAGE SLUDGE COMBUSTION. *Water Works Wastes Eng., vol. 2:90-93, Sept. 1965.*

A description is given of the Dorr-Oliver FluoSolids Disposal System which was installed at the East Cliff-Capitola, California sewage treatment plant. The plant has an average flow of 2.8 mgd primary organic solids and the system is currently burning solids at the rate of approximately 300 lb/hr. The sludge is dried, burned, and deodorized in a suspended hot sand bed at 1250 F, producing inert ash and gaseous combustion products which are discharged from the system. Gases emitted from the reactor are cleaned in a liquid scrubber and they emerge from the stack in a white odorless plume of water vapor. The ash is removed from the scrubber water in a small cyclone and is periodically disposed of by landfill. Mass spectrographic analysis of the stack gases showed that they contained no organic by-products of combustion, small amounts of nitrogen dioxide and sulfur dioxide, and about 16% water vapor by volume. Particulates were emitted at a rate of 0.038 to 0.039 gr/standard cu ft. The operating costs, procedure, and experience to date is summarized.

1961

32352 **APTIC NO. 54837**

Whitby, K. T. and D. A. Lundgren

FRACTIONAL EFFICIENCY CHARACTERISTICS OF A TORIT UNIT TYPE CLOTH COLLECTOR. *Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering, Torit Corp. Technical Report, 6p., Aug. 1961. 3 refs.*

Fractional efficiency characteristics of a unit type cloth collector were obtained by measuring the efficiency on a series of homogeneous aerosols as opposed to using overall weight efficiency as an index of dust collector performance. The fractional efficiency data obtained were plotted on a log probability plot. The characteristic shapes of the fractional efficiency curves of the cloth collector tested were similar to that of high performance fibrous filters having efficiencies above 95% at 0.3 micron. The curves show a characteristic minimum efficiency at about 0.3 micron, and an increasing efficiency below 0.3 micron due to diffusion and above 0.3 micron due to interception. The data indicate little correlation between the overall weight efficiency on a broad size distribution dust and the fractional efficiency at about 0.3 micron.

1956

32353 **APTIC NO. 55053**

Given, M. D.

FLUE GAS SOLVES LIME WASTE TREATMENT PROBLEMS. *Power Eng., vol. 60:93-98, Oct. 1956.*

A method of scrubbing flue gas with soda ash to remove both fly ash and corrosive sulfur compounds simultaneously is described. The scrubbing is used in conjunction with the flue gas method of precipitating heavy lime wastes in the glue and tanning industries. Scrubbing is accomplished in two steps: first, in the venturi by injecting scrubbing liquid at right angles to the gas flow, and second, in the cyclone where the gas again contacts scrubbing liquid in the form of a fine mist from high pressure spray nozzles. The bulk of fly ash and corrosives is removed in the first scrubbing operation, while most of the balance is removed in the second stage. Entrained liquid is spun out centrifugally in the separator and returned, via a Callow cone for solids removal, to the system for recirculation. Before recirculation, water lost by evaporation and underflow is made up by a float valve and box arrangement, and fresh soda ash is added to maintain the pH of the scrubbing liquid at 7.0 to 8.0. A rotameter controls additions of soda ash conveniently. Details of the pilot plant experiments that preceded construction of the full scale facilities at the Eastman Gelatin Corporation s Peabody plant are described.

1948

32354 **APTIC NO. 54680**

Collins, T. T., Jr.

PILOT PLANT STUDY OF A MULTICLONE UNIT OPERATING ON STACK GASES FROM A LIME KILN. *Paper Trade J., 126(12):63-64, March 18, 1948. 4 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Alkaline Pulping Committee and Paper Industry, Alkaline Pulping Committee, Asheville, N. C., Oct. 10, 1947.)*

The following devices have been used to recover dust from the stack gases of the rotary lime kilns in alkaline pulp mills: type N Roto-clones, wet scrubbers, Thermix dry cyclone units, multiclone installations, cyclone spray towers, and simple stack sprays. In one mill, the stack loss of lime was reduced by reducing the air leakage into the lime reburning system. A microscopic determination of the particle size distribution of a sample of lime dust collected in a Southern mill was made. Approximately 95% by weight of the lime kiln dust in that mill had a particle diameter of between 5 and 25 micron. In reducing the amount of lime dust being lost in the exit gases from that kiln, methods such as scrubbing, which would cool the gases, had to be eliminated. The efficiency of a multiclone unit was therefore investigated. The efficiency of a full-scale unit operating at this mill would range from 70 to 80%, thereby reducing the amount of lime leaving the stack from 11,000 to approximately 3000 lbs/day. Some savings would be expected to result from the reclamation of salt cake and lime recovered by the unit. The gas velocity through the duct and the multiclone was probably sufficient to prevent much settling of the lime dust on the vanes and tubes. Units of this type for this application should be provided with holes for lancing the tubes, and should be insulated. The installation of the unit in this particular instance was justified by the fact that the stack gases were not as cooled and saturated as they would be by efficient stack sprays or a simple type of cyclone scrubber.

1947

32355 **APTIC NO. 54706**

Deringer, Hans

AN ABSORBENT FOR THE SEPARATION AND RECOVERY OF CARBON MONOXIDE FROM GASEOUS MIXTURES. *(Ueber ein Absorptionsmittel zur Auswaschung und Gewinnung von Kohlenoxyd aus Gasgemischen). Text in German. Chimia, 1(6):125-131, 1947. (Translation also available from TRANS-CHEM, Inc., P.O. Box 6219, Knoxville, Tenn., 37914, as C214093.)*

Laboratory tests on the separation and recovery of carbon monoxide from heating gas at ambient temperature and atmospheric pressure are described. Carbon monoxide is absorbed by an aqueous solution of copper chloride and magnesium chloride. The sorption pressure investigations revealed that the volume of CO dissolved per unit of absorbent liquid increases with copper chloride expenditure. The sorption pressure remains, for identical CO load in the liquid, nearly constant, regardless of the CuCl content. Changes in the $MgCl_2$ concentration cause no changes in the maximum CO absorption or in the sorption pressure. A lowering of the sorption temperature enhances CO absorption, reduces the sorption pressure, and speeds up the establishment of equilibrium conditions. The desorption of CO or the regeneration of the wash liquid takes place very quickly under vacuum. The residual CO content in the gas lies at around 1%.

MEASUREMENT METHODS

1973

32356 **APTIC NO. 54263**

Oak Ridge National Lab., Oak Ridge, Tenn., Analytical Chemistry Div

PRELIMINARY ANALYSIS OF AIR-FILTER IMPURITIES AT THE NEW HIGH-FLUX NEUTRON ACTIVATION LABORATORY. *In: Analytical Chemistry Division Annual Progress Report for Period Ending September 30, 1972. Atomic Energy Commission Contract W-7405-ang-26, UC-4--Chem., p. 37-38, Jan. 1973.*

NTIS: ORNL-4838

Levels of impurities in air-filtering materials were established in order to determine the analytical detection limits for the instrumental analysis of air particulate concentrations. The trace elements were measured by absolute neutron activation analysis.

32357 **APTIC NO. 54605**

Environmental Protection Agency, Washington, D. C., Working Group 1

HIGHWAY AIR QUALITY ANALYSIS AND EVALUATION. *In: Highways and Air Quality Special Report 141. p. 34-45, 1973.*

The mesoscale and microscale relationships of a highway which can be considered as representing a continuous line source of pollutant emissions to air pollution are considered. The primary purpose of mesoscale monitoring is to provide a data base of air quality information that can be compared to air quality standards. Secondary purposes are to validate appropriate dispersion models and to define a background of existing air quality that is disturbed by conditions close to the highway, i.e., microscale phenomena. An important pollutant to consider in mesoscale evaluation is oxidant ozone; the source of pollutants forming ozone will normally be located at least several kilometers upwind and will be difficult to define. Other parameters that should be measured are nitric oxide, nitrogen dioxide, carbon monoxide, nonmethane hydrocarbons, lead, and nonspecific particulates. Mesoscale modeling at the system planning level provides the necessary prediction of background conditions to which concentrations predicted by microscale techniques must be added to show concentrations that will be experienced at critical observation points in the highway corridor (1 to 1000 m). The mesoscale background value added should be that upwind of the proposed link to avoid double addition of pollutant predictions associated with that particular link. A list of several recommendations is provided for future work and research pertaining to the relationship of highways to air pollution.

32358 **APTIC NO. 54609**

Environmental Protection Agency, Washington, D. C.

SAMPLING LOCATION GUIDELINES. *In: Highways and Air Quality Special Report 141. p. 81-83, 1973.*

A table of sampling location guidelines for areas of estimated maximum air pollutant concentration is provided for primary stationary sources of sulfur dioxide, nitrogen dioxide, and particulate matter; primary mobile sources of carbon monoxide; and secondary sources of oxidants and nitrogen dioxide. It is recognized that for practical considerations it may not be feasible to select sampling sites that meet all of the specific and general guidelines; hence, it is especially important that the sampling stations selected be defined in such a manner that enables comparison of results obtained with those obtained at other sampling stations meeting the guidelines. This may be accomplished by delineating the critical parameters including elevation, vertical clearance, horizontal clearance, distance from curb, distance from downtown, distance from major traffic arteries or parking areas, restrictions to air flow in the vicinity of sampler, nearby local sources, and meteorological parameters.

32359 **APTIC NO. 55177**

INSTRUMENTATION AND TECHNIQUES FOR MEASUREMENT OF AIR POLLUTION. *Preprint, American Chemical Society, New York, 16p., 1973. 44 refs.*

The measurement techniques and instrumentation related to the air pollution control program (EPA) being conducted by the Environmental Protection Agency are summarized. Particulate matter in ambient air is measured by the high volume sampler. Particulate matter in emissions from stationary sources is measured gravimetrically. Sulfur dioxide in ambient air is measured by the pararosaniline method, or a flame photometric detection system. Continuous measurement of nitrogen dioxide in ambient air is accomplished by chemiluminescent reactions between nitric oxide and ozone. The ambient air standard for photochemical oxidant is based on a measurement technique for O_2 and uses a chemiluminescent reaction between O_3 and ethylene. Hydrocarbons in the ambient air are measured by a flame ionization detector. Hydrocarbons in mobile source emissions are measured by a flame ionization detector or by nondispersive infrared spectrophotometry. Carbon monoxide in ambient air and in mobile and stationary source emissions is measured by nondispersive infrared spectrophotometry. Hydrogen sulfide emissions from petroleum refineries are measured by collection in alkaline cadmium hydroxide solution to form cadmium sulfide. The hazardous mercury in particulate and gaseous emissions from stationary sources is measured by collection in an iodine monochloride solution. Beryllium is measured by digestion in an acid sollution followed by analysis using atomic absorption. Air quality standards, calidration methods, and research techniques are discussed.

32360 **APTIC NO. 54780**

Adams, D. F., J. O. Frohliger, D. Falgout, A. M. Hartley, J. B. Pate, A. L. Plumley, F. P. Scaringelli, and P. Urone

TENTATIVE METHOD OF GAS CHROMATOGRAPHIC ANALYSIS FOR SULFUR CONTAINING GASES IN THE ATMOSPHERE (AUTOMATIC METHOD WITH FLAME PHOTOMETER DETECTOR). *Health Lab. Sci., 10(3):241-250, July 1973. 16 refs.*

An automated, semicontinuous technique for the detection and determination of low molecular weight sulfur-containing gases in the atmosphere is presented. The method makes use of the specificity of the flame photometric detector (FPD). The limits of detection at twice the noise level at present for hydrogen sulfide, sulfur dioxide, methyl mercaptan, and dimethyl sulfide range from 5 to 13 micrograms/cu m (0.002 to 0.005 ppm), and the sensitivity is 0.00016 micrograms/sec. The linear dynamic range is approximately 130 micrograms/cu m (0.05 ppm) to 500 micrograms/cu m (0.2 ppm). The FPD discrimination ratio is approximately 10,000:1 for hydrocarbons and at least 1000:1 for other gases. Although both air and phosphorus present potential sources of interference, under the conditions of the method (gas chromatographic separation), neither would cause significant interference. The precision of the FPD depends upon close control of the sample flow and hydrogen flow to the detector mechanism, while accuracy depends upon the ability to control the flow and temperature of the dilution gas over certified or calibrated permeation tubes maintained in a gas dilution device. The automated FPD system will consist of: a regulated port valve; a gas chromatography column and an isothermal or temperature programmable column oven, an electrometer; a means of recording the electrometer output; and an air sample pump. The reagents include hydrogen, air, permeation tubes, Deactigen 100-200 mesh, Triton X-305, and Chromosorb G HP, 100-200 mesh. Calibration and storage requirements are discussed, as is the method of calculation.

32361 **APTIC NO. 55284**

Alfano, Gaetano and Vittorio Betta

A PROPOSAL OF CORRELATION BETWEEN DATA FROM GRAVIMETRIC AND DISCOLORATION METHODS ON SUSPENDED DUST. *(Proposta di correlazione fra rilievi gravimetrici e colorimetrici di polveri sospese). Text in Italian. Termotecnica (Milan), 29(8):440-443, 1973. 3 refs.*

A proposal of correlation between data from gravimetric and discoloration methods on suspended dust is presented. The validity of the methods of gravimetric and discoloration analysis, according to their respective fields of application, requires correlations allowing comparison between the results by the two methods. A more general correlation between the weight of the dust deposited and the changes in the transparency of the sampling filter is obtained. Either the assumptions upon which the proposed model is based, or the difficulty and often the impossibility of easily defining the physical and granulometric characteristics of the deposited dust, make the proposed correlation application only to some border cases. This correlation attempts to rationally frame the phenomenon and hint at the firm of possible empirical correlations between data from gravimetric and discoloration methods. (Author abstract modified)

32362 **APTIC NO. 54866**

Barnes, R. A.

DUPLICATE MEASUREMENTS OF LOW CONCENTRATIONS OF SMOKE AND SULPHUR DIOXIDE USING TWO NATIONAL SURVEY SAMPLERS WITH A COMMON INLET. *Atmos. Environ., 7(9):901-904, 1973. 4 refs.*

Results were compared from two National Survey-type Daily Volumetric Air Pollution Samplers operating under site conditions and measuring concentrations of smoke and sulfur dioxide similar to those which would be observed at National Survey country sites. Twenty sets of observations were made from the two samplers using the same supply of reagents and glassware and a further 18 using a separate supply for each. In both parts of the experiment the agreement between corresponding observations of smoke concentration was good but was less satisfactory in the case of SO2. On individual occasions the latter was sometimes quite poor, particularly in the second part of the experiment. This type of sampler will give reasonably consistent and reliable measurements of smoke concentration even when these concentrations are very low. The measurements of low SO2 levels with such instruments, however, was less satisfactory unless care and precision beyond that which might be expected of most operators (usually laymen) was employed. (Author abstract)

32363 **APTIC NO. 54761**

Bartosiewicz, Leslie

IMPROVED TECHNIQUES OF IDENTIFICATION AND DETERMINATION OF AIRBORNE ASBESTOS. *Am. Ind. Hyg. Assoc. J., 34(6):252-259, June 1973. 6 refs.*

Sample collection is the most important step in analyzing for airborne asbestos particles. Study samples of asbestos fibers were collected using the approved National Institute for Occupational Safety and Health (NIOSH) technique and a modified NIOSH technique. The former involves the use of short, open-face filter holder with a 37 mm, type AA, millipore filter supported on a base pad; the samples collected in this way do not present a reliable or reproducible base for the analysis. The technique was modified so that the filter holders were fitted with a plenum 1.75 in. high over the base of the filters: this provided for a more uniform and representative collection of particles. A low temperature asher can be used to eliminate the presence of the filter prior to analysis. The particles can then be easily and accurately measured with an image analyzing microscope (IAM) following separation of the asbestos particles from other solid airborne pollutants via the refractive index liquid method. The accuracy of this method relies on the large number of particles counted and the large number of areas covered. It is also important that within these areas, all particles be counted. The IAM method allows one to distinguish asbestos particles from other fibrous material.

32364 **APTIC NO. 54872**

Bendixen, Hans

CORRECTION OF INSTATIONARY EXHAUST GAS MEASUREMENTS WITH THE INFRARED ANALYZER. *(Korrektur bei der instationaeren Abgasmessung mit dem Ultrarot-Analysator). Text in German. Motortech. Z. (Stuttgart), 34(10):323-328, Oct. 1973. 7 refs.*

Possibilities and limits of reducing dynamic indicating errors of instationary engine exhaust gas measurements with the infrared analyzer URAS 2 are discussed. A small time constant can be achieved with a small geometric volume and a large volume flow. A considerable amount of the geometric volume which increases the time constant is needed for cooling. Therefore optimal cooling is necessary. The cooling process is difficult to calculate because the heat capacity is not constant. For the calculation of the heat transfer number, neither the equation for turbulently flowing gases nor the one for film or droplet condensation can be used. Thus a number of tests were performed. With a throttle valve the exhaust gas volume flow was altered. The exhaust gas temperatures and pressure losses were measured at various points. The heat transfer number had a greater influence on the cooling process than the surface to volume ratio. Therefore an exhaust gas measuring set-up is recommended where the exhaust gas goes to the cooler over a 2 m long copper pipe through which it is cooled to the dew point (50 C). In the preliminary cooler (a 0.2 m copper pipe) the gas is cooled to room temperature. This leaves the coarse filter dry. The main cooler is left with a temperature of 6 C, which corresponds to a residual water vapor concentration of about 1%. For each exhaust gas analyzer the exhaust gas flow can be optionally adjusted. The adjustable idle time is 2 sec, the 90% time is 3.8 sec.

32365 **APTIC NO. 54601**

Biacs, Peter

MEASUREMENT OF THE MICROBIOLOGICAL AIR POLLUTION. *(A levego mikrobiologiai szennyezetssegenek merese). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):197-203, 1973. 36 refs.*

Studies on the microbiological air pollution are reviewed. Microbiological air pollution which is due to pollens, microbes and molds, constitutes a problem in closed places, in industrial processes involving the use or emission of microorganisms, and especially in urban agglomerations, where the microorganism counts exceed by far the background value of 100-500/cu m. Aerobacter aerogenes, Bacillus cereus, B. liceniformis, B. megatherium, B. mycoides, B. subtilis, Micrococcus aureus, Proteus vulgaris, Bac. ruminatus, B. aerosporus, Sarcina lutea, B. cercus, Kurthia zopfi, Aspergillus niger, A. glaucus, A. calyptratus, Cladosporium species, Hormodendrum herbarum, and Penicillium glabrum are among the principal airborne microbes. While many microorganisms die shortly after release into the atmosphere, others are viable for weeks or months, and some species were even detected in altitudes up to 5500 m. The microbial air pollution is lowest in winter, and highest in summer and spring. Close correlation between the dust and microorganism concentrations in the air was established, since microbes are mostly adsorbed on dust particles while present in the atmosphere. A dust fraction of 10 to 150 micron is chiefly responsible for binding microbes. Microbial air pollution can be measured quantitatively by cultivation following capture by such processes as the Koch sedimentation process, the impact method, filtration and washing techniques.

32366 **APTIC NO. 54879**

Bignardi Luigi and Michele Troilo

DEVELOPMENT OF A DIESEL SMOKE-METER. *(Sviluppi di un opacimetro per la valutazione della fumosita dei motori diesel). Text in Italian. Termotecnica (Milan), 27(6):291-301, 1973. 2 refs. (Presented at the Congresso Nazionale ATI, 26th, L Aquila, Italy, Sept. 1971.)*

The instrument workd on the principle of variation of light intensity of a bundle of rays passing through a defined thickness of flowing gas as measured by means of a photocell. Special construction is designed to correct the drawback of older models where soot deposit on lenses caused errors. The exhaust gas is led into a venturi tube where at the point of constriction a bundle of rays emitted by an incandescent light passes through an optical condenser and the gas stream perpendicularly to its flow direction. The bundle of rays emerging from the condenser reaches a semireflecting mirror which divides it into two parts. One, deflected by 90 deg, is aimed at a photocell, the other continues in its original direction, passes the gas flow twice being reflected by a mirror, and returns to the semireflecting mirror which deflects it to a second photocell. The difference in readings of the two photocells (the one a reference cell, the other a measuring cell) is the absorption value. Gauging and the control of linearity of the system is performed by the placing filters representing known values of optical density on the semireflecting mirror. The gas flow diameter is 100 mm; results obtained can be affected by the temperature of the instrument. A cooling sleeve is mounted around the venturi tube when the instrument is used on exhaust gas from motors under load when the high gas heat would affect measuring results. The instrument meets requirements for tests stipulated by existing regulations.

32367 **APTIC NO. 55264**

Birkle, M.

LIDAR MEASUREMENTS IN THE SERVICE OF ENVIRONMENTAL PROTECTION. *(Lidar Messverfahren im Umweltschutz). Text in German. Messtech., no. 9:280-288, 1973. 27 refs.*

Lidar, light detecting and ranging, is a measurement principle resembling microwave radar except that instead of microwaves it uses light impulses emanating from a laser light source. When the light meets a reflecting object its distance can be calculated from the time elapsed between emission and reflection. Raman scattering, Resonance-Raman scattering, Resonance scattering, and Mie scattering contribute to Lidar measurements in a free atmosphere but only for Mie scattering is a commercial instrument of sufficient sensitivity available. The YAG laser is especially suitable for the construction of small portable air-cooled instruments for which two fields of application are open in the area of environmental protection. One is the determination of meteorological parameters in the form of measurements of height of clouds and of inversion strata. The latter can be determined by lidar when, as is invariably the case over industrial centers, the particulate concentration is high just below the border stratum or when the inversion border is debinuted by fog or by cloud formation. The second application is the measurement of nongaseous effluents in smoke plumes. This can be accomplished by measuring transmittance where the extinction of the smoke plume emerging from the stack is measured or by reflection measurement which evaluates the target echo directly. In the latter case the stack echo is used for reference. The latter method was applied to a smoke plume emitted by the Karlsruhe power plant which disclosed that the steam quantity produced by the power plant was proportional to the smoke density emitted by the stack. The advantage of Lidar measurements is in the circumstance that the result is an average of many measurements and not as in the case of other methods the result of only one.

32368 **APTIC NO. 55163**

Blosser, E. R.

DEVELOP AND OPERATIONAL SYSTEM FOR EVALUATING AND TESTING METHODS AND INSTRUMENTS FOR DETERMINING THE EFFECTS OF FUEL AND FUEL ADDITIVES ON AUTOMOBILE EMISSIONS. (FINAL REPORT, 1 YEAR). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-0324, EPA-R2- 73-160, Program Element A11002, 60p., Feb. 1973.*

NTIS: PB 222334

To determine the causes of observed weight variations in collected particulates from automobile exhaust, the chemical and physical properties of unused glass fiber filters were studied, and some chemical analyses of collected exhaust particulates were performed. Real differences exist and can be measured among the weights of diluted automotile exhaust collected on different types of filters; similar differences are not apparent when particulate matter from ambient air is collected. However, no single factor or combination of factors has been identified as the cause of these variations. Although some trends and possible relationships might be postulated from the data collected, these cause-effect relationships are tenuous at best; more data are needed to establish definite links. Recommendations for future work are presented. (Author abstract modified)

32369 **APTIC NO. 54940**

Bohl, C. D. and E. F. Kaelble

DETERMINATION OF ELEMENTAL PHOSPHORUS IN AIR BY GAS CHROMATOGRAPHY. *Am. Ind. Hyg. Assoc. J., 34(7):306-309, July 1973. 4 refs.*

A rapid, sensitive, and specific method for the determination of elemental phosphorus in air is described. The P in a measured volume of air is collected in xylene, and a portion of the C6H4(CH3)2 solution is injected into a gas chromatograph equipped with a flame photometric detector. Phosphorus elutes in about 3 min as a sharp peak whose height is linearly proportional to concentration. As little as 10 to the -11th power gm of P can be detected. Under typical test conditions, this corresponds to 0.0004 mg of P/cu m of air. Overall long term reproducibility of the method over the range of concentrations studied is + or 0.003 mg/cu m. Air samples from a P plant were analyzed by the gas chromatographic method and by a colorimetric procedure formerly used. The superiority of the new method is demonstrated. The study did not indicate excessive exposure of workers to P vapor. (Author abstract)

32370 **APTIC NO. 55280**

Bolle, Hans-Juergen

THE USE OF SATELLITES FOR THE MEASUREMENTS AND MONITORING OF CLIMATIC PARAMETERS AND AIR POLLUTANTS. *(Die Anwendung von Weltraumtechniken auf die Erfassung und Ueberwachung von Klima-Parametern und luftverunreinigenden). Text in German. Raumfahrtforschung, 17(4):169-174, 1973. 32 refs.*

The use of satellites for the measurement and monitoring of climatic parameters and air pollutants is discussed. Climate is primarily determined by the radiation balance which can be disturbed by man's activity. Possible changes of climate can be studied by means of mathematical climatological models. The necessary input data must be sampled over the whole earth for a long period. Satellites can advantageously be used to gather data about some of the most important parameters such as planetary radiation budget and its variations in space and time, clouds, particles, and trace gases. (Author abstract modified)

32371 **APTIC NO. 54533**

Brenner, A. R. and S. G. Kukolich

ANALYSIS OF SO2 CONCENTRATION IN AIR BY MICROWAVE SPECTROSCOPY. *Anal. Letters, 6(8):691-697, 1973. 5 refs.*

Low concentrations of sulfur dioxide in air were measured using a Stark modulated microwave spectrometer. Measurement of the intensity of absorption lines for rotational transitions gives a quantitative measure of the concentration of specific small molecules. Concentrations of 20 ppm of SO2 in air were easily detected with a signal to noise ratio of over 20/l with a 5 sec time constant using a straight forward sample concentration technique. (Author abstract)

32372 **APTIC NO. 54942**

Cares, Janet W., Abraham S. Goldin, John J. Lynch, and William A. Burgess

THE DETERMINATION OF QUARTZ IN AIRBORNE RESPIRABLE GRANITE DUST BY INFRARED SPECTROPHOTOMETRY. *Am. Ind. Hyg. Assoc. J., 34(7):298-305, July 1973. 31 refs.*

An infrared technique for the determination of quartz in respirable granite dusts is described which has been used in a survey of the granite industry to obtain with reasonable confidence a general picture of the quartz dust concentrations to which workers are exposed. The procedure is simple and can be carried out by technicians. Thirty to 35 samples can be processed/day with about an additional 1/3 day required for scanning the potassium bromide pellets. Pellets are mounted and may be permanently retained. Sample calculation is simple and can be readily adapted for machine calculation or computer. By this method of analysis, it should be possible to establish a threshold limit value (TLV) based on milligrams of respirable quartz/cu m of air, either in place of or in addition to the presently accepted TLV. (Author abstract modified)

32373 **APTIC NO. 55281**

Clark, R. P.

A PARTICLE DETECTOR FOR USE IN VENTILATION ENGINEERING. *J. Hyg., 71(3):577-583, Sept. 1973. 3 refs.*

An electronic particle counting device for use in ventilation engineering is described. The basis of the sampler is a constant temperature hot wire anemometer on to which particles from an air stream land. The present device employs a hot wire anemometer probe enclosed within a nozzle. The electronic circuits are battery powered and the apparatus is portable when used with a battery operated electronic counter. A block diagram of the component parts of the detector and the complete apparatus are given. The device traces the motions of droplets and measures their concentration within ventilated areas when subjected to different types of ventilation. In this way the effectiveness of various systems may be determined. (Author summary modified)

32374 **APTIC NO. 54870**

Cluck, James W., William S. Adams, and William J. Moroz

A PORTABLE BATTERY OPERATED AIRBORNE PARTICLE COUNTER AND SIZE ANALYZER. *ISA (Instr. Soc. Am.) Trans., 12(3):208-216, 1973. 4 refs.*

This analyzer provides necessary particle data for rapid analysis of dust in locations remote from electrical power supplies. The analyzer has the following characteristics: digital readout in particles/cu cm; recorder/printer output; 100 cc/min continuous air sample; variable sample time; multirange; variable range size; automatic/manual readout of all ranges; total count (sum of ranges); secondary calibration scheme; overrange indication; battery operated (6 hr continuous service); rechargeable power supply; battery discharged indicator; and portable (17.7 lb). The instrument is easily operated and is of overall rugged construction. In working the system, a continuous air sample is taken and analyzed for number of particles. This is accomplished in seven size ranges by counting pulses and discriminating pulse heights at the output of an optical photometer. The information is then displayed serially on a digital display. (Author summary modified)

32375 **APTIC NO. 54313**

Corte, G. and L. Dubois

APPLICATION OF SELECTIVE ABSORBERS IN THE ANALYSIS OF MERCURY IN AIR. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-297.)*

Unsatisfactory experience with four commercially available continuous and semicontinuous photometric mercury monitors led to the development of a simple integrated sampling method for mercury using silver absorbers. This led to the accumulation of some experimental data on absorbing materials of interest in mercury sampling and analysis. Even automatic and continuous analyzers usually require specially built sampling and sample handling devices. Such sample handling manifolds consist of a system of valves, pumps, flowmeters, absorbers, and associated plumbing which allow the operator to make accurate measurements of zero, span, and unknown samples. To achieve a valid zero for an instrument, it must be possible to prepare an air or inert gas stream which is completely free from mercury. This may be done by passing the stream, at an appropriate flow rate, through palladium chloride or activated charcoal or silver. Since palladium chloride reacts chemically and irreversibly with mercury vapor, its use should be restricted to those applications where permanent absorption is acceptable. For the integrated sampling method, a reversible absorber--silver--is required. Charcoal is useful for preparing mercury-free zero conditions, but is less satisfactory than silver as a reversible air sampling collector. The sensitivity, accuracy, and stability of mercury monitors are now actively being improved. However, one of the most important limiting factors in the use of such instruments is the ability to produce a satisfactorily low blank or zero. With respect to mercury, a true zero can only be produced by means of absorbers, while other ultraviolet absorbing substances can be compensated for by the use of true double beam principles. (Author summary modified)

32376 **APTIC NO. 54750**

Cranmer, M. and A. Peoples

DETERMINATION OF TRACE QUANTITIES OF ANTICHOLINESTERASE PESTICIDES. *Anal. Biochem., 55(1):255-265, Sept. 1973. 8 refs.*

A procedure is described which is applicable to the screening of large numbers of samples for trace quantities of anticholinesterase pesticides. The method is a modification of a sensitive procedure for the gas chromatographic determination of acetylcholinesterase. It is sufficiently sensitive to detect cholinesterase inhibition due to as little as 30 ppt paraoxon, 3 ppb malaoxon, or 2 ppm of carbaryl in either ethylene glycol or water. While the method does not allow for the absolute differentiation between compounds which might be present, some classification is possible, i.e., for compounds which must be activated before they possess anticholinesterase activity. (Author abstract)

32377 **APTIC NO. 54754**

Dams, R., R. Heindryckx, and K. van Cauwenberghe

CHEMISTRY AND AIR POLLUTANT ANALYSIS. PART 3: APPENDICES. *(Scheikunde en analyses van luchtpollutie. Deel III: Appendices). Text in Dutch. Ind. Chim. Belge., no. 38:627-648, June 1973. 58 refs.*

Air pollutant analysis and pollution monitoring currently applied in the USA, the Netherlands, and Norway are surveyed, and recent developments in the air pollutant analytical area are reviewed. National and regional air pollution monitoring networks in the USA analyze dust, sulfur dioxide, nitrogen dioxide, and oxidant concentrations on specific days. The SO2 concentrations are determined by means of a Technicon autoanalyzer which permits continuous spectrophotometric analysis according to the West-Gaeke method. The NO2 and nitric oxide concentrations are measured by the modified Saltzman method. Nondispersive infrared spectroscopy is applied to carbon monoxide. Aerosl samples collected by means of high-volume samplers are analyzed for their metal contents and for sulfates, as well as for benzene-soluble organic matter. Neutron activation analysis is being increasingly used for the analysis of the inorganic components of aerosols, and it delivers valuable data on the origin, geographic distribution, short-term concentration variations, and the effects of meteorological conditions and particle size on the dispersion of the aerosols and the distribution of the individual elements. Combinations of gas chromatography with mass spectrometry are used for the analysis of organic gaseous pollutants.

32378 **APTIC NO. 55186**

Draemel, Dean C.

RELATIONSHIP BETWEEN FABRIC STRUCTURE AND FILTRATION PERFORMANCE IN DUST FILTRATION. (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Proj. 21ADJ51, EPA-R2-73-288, Program Element 1A2012, 85p., July 1973. 6 refs.*

NTIS: PB 222237

A semi-empirical relationship between clean cloth fabric structural parameters, dust parameters, and filtration performance is identified. The criterion for high outlet concentration as a result of bleeding or seepage of dust is a function of the pore size distribution of the fabric versus the size properties of the dust. The pressure of a significant number of pores with a characteristic dimension roughly 10 times the mass mean particle diameter of the dust being filtered leads to bleeding and seepage of dust. This conclusion results from studies with three dusts (fly ash, limestone, and silica), a number of fiber types, and a range of fabric construction variables. Pressure related filtration performance can be correlated against clean fabric free area if well defined yarn boundaries are present. Since filtration fabric yarn boundaries are generally not well defined, pressure-related filtration performance can be correlated against clean cloth Frazier permeability. (Author abstract)

32379 **APTIC NO. 55109**

Ellis, D. H.

RELIABILITY OF STACK SAMPLING METHODS VS CONTINUOUS MONITORING SYSTEMS. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 145-147. 1 ref. (March 29-30.)*

A monitoring system on a demanding application at the Union Carbide Institute, W. Va., Plant, involving eight old 150,000-pound boilers with automatic pulverized coal feed is described. In addition to the basic fuel, these boilers are fed a wide variety of wastes from petrochemical and associated processes, varying from unsaturated gases to heavy liquids, some water soluble, some not. Neither a TV monitor nor smoke watchers were satisfactory. Each boiler was equipped with new four field precipitators capable of holding emissions within the stringent WVAPCC limitations when properly tuned and with combustion under control. The chosen system was a recent model of the light attenuation type which has been used in various forms for years. The light source and receiver were installed in the 10-foot dimension of the stack and connected to a recorder calibratible to any desired opacity range. A 24-hour circular chart was chosen to facilitate supervisory examination and discussion. The instruments raliability signal emissions wandering significantly above the visible level and are relied on by the operators to signal the need for attention. The installation has significantly reduced the incidence and duration of visible emissions. This system is reliable for operational control, but does not lend itself to calibrations in mass emission rate, and cannot be considered as reliable as customary isokinetic sampling methods.

32380 **APTIC NO. 54540**

Enke, Christian GG.

MEASUREMENT INSTRUMENTS AND ANALYZERS FOR GASES AND DUSTS. *(Mess- und Analysengeraete fuer Gase und Staeube). Text in German. Wasser Luft Betrieb, 17(9):283-287, 1973.*

Indoor air monitors for carbon monoxide, visibility measuring instruments, infrared analyzers, a hydrogen sulfide analyzer, dust filters, and a smoke and dust measuring instrument operating on the principle of light extinction measurements are described and illustrated. Traces of H2S are measured with a reagent bearing paper band passing successively through two chambers, the first one for comparison and the second one holding the measurement gas. The measurement range of the analyzers is 0 to 16 ppm and can be switched to 0 to 32 ppm. The reagent reacts with H2S and changes its color. This effect is measured. The dust filter measures the aerosol concentration by drawing on air and passing it through a glass fiber filter band. The dust retained on the filter band is measured gravimetrically with beta radiation. A radioactive beta radiator is installed opposite two ionizing chambers.

32381 **APTIC NO. 54375**

Esmen, Nurtan A.

A DIRECT MEASUREMENT METHOD FOR DUSTFALL. *J. Air Pollution Control Assoc., 23(1):34-36, Jan. 1973. 5 refs.*

The design and calibration of a simple photometer to measure dust fall are described. The photometer was constructed using a uniform light source and a silicon photovoltaic cell. The response of the cell was modified by a near infrared filter to simulate the human eye. The cell response is measured by a simple galvanometer and a balancing resistor. The photocell was effectively calibrated using relatively large particles deposited on a clean surface. The distance between the photocell and the sample was calculated easily by resolution of images. Uniform light supply was a photoflood light placed 100 cm away from the sample. Four locations were chosen to collect field data to obtain a set of results that would be realistically representative of the dust fall. The method of sampling was to expose a premeasured Millipore AA filter to settled dust a specified time interval, and then to determine the change in the reflectance using the photometer. The rural station showed the least soiling potential, whereas the industrial community showed the most. The lack of statistically significantly difference between the suburban sites cannot be generalized due to the smallness (8) of the sample size.

32382 **APTIC NO. 54424**

Forrest, Joseph and Leonard Newman

AMBIENT AIR MONITORING FOR SULFUR COMPOUNDS, A CRITICAL REVIEW. *J. Air Pollution Control Assoc., 23(9):761-768, Sept. 1973. 82 refs.*

Analytical techniques for monitoring ambient air for sulfur compounds are reviewed. The compounds include sulfur dioxide, total particulate sulfate, sulfuric acid, ammonium sulfate, ammonium bisulfate, metal sulfate, hydrogen sulfide, and organic sulfides. Although many analytical techniques, both qualitative and quantitative presently exist, a large number require future development to attain a capability for identifying and measuring species at very low concentrations. Whenever possible continuous monitoring instrumentation and techniques are desirable. However, periodic samples must also be collected to permit a more detailed examination for alternate methods or for those constituents not amenable to continuous monitoring. The main problems are in the monitoring of SO2, total particulate sulfate, H2SO4, and the ammonium sulfates. All commercial instruments for monitoring SO2 lack sensitivity. The lowest realistic detection limit is about 0.01 ppm, but the SO2 level in nonurban environments is about 2 ppm. By combining gas chromatographic flame photometric detector and a chromatographic column, detectability is 2 ppb. There are no instrumentations for continuously monitoring total particulate sulfates or H2SO4. There is no way to determine ammonium sulfate in airborne particulates, but positive identification can be obtained by morphological examination by electron microscopy and electron diffraction patterns. Other analytical methods include conductimetry, electrochemical, spectrophotometric, West-Gaeke, colorimetry, and spectrometry.

32383 **APTIC NO. 54648**

Gelbwachs, Jerry and Milton Birnbaum

FLUORESCENCE OF ATMOSPHERIC AEROSOLS AND LIDAR IMPLICATIONS. *Appl. Opt., 12(10):2442-2447, Oct. 1973. 26 refs.*

The fluorescence of aerosols in the ambient atmosphere was monitored in situ using cw argon ion laser excitation in the bands of 50 nm and 100 nm over the spectral region of 560-810 nm. Both aerosols and nitrogen dioxide were concurrently monitored by fluorescence in real time. Fluorescence is a potentially useful means for aerosol identification and monitoring. Ambient aerosol fluorescence may hinder remote sensing of atmospheric pollutants. Under conditions of severe aerosol loading, aerosols may generate signals equivalent to 600 ppm of sulfur dioxide, 6000 ppm nitrogen oxide, and 3000 ppm of carbon monoxide as measured by Raman scattering and 1 ppm of NO2 as determined by fluorescence when excited at 488 nm. To resolve the desired signals from aerosol fluorescence, a two-wavelength excitation method was proposed and demonstrated in in situ measurements. For utilization of pollutant detectability calculations, i.e., signal to noise ratios, for single wavelength lidar in which aerosol fluorescence was neglected, curves were presented that transform these signals to noise ratios to ones applicable for two wavelength lidar determinations in the presence of aerosols. (Author conclusions modified)

32384 **APTIC NO. 54628**

Gilfrich, J. V., P. G. Burkhalter, and L. S. Birks

X-RAY SPECTROMETRY FOR PARTICULATE AIR POLLUTION--A QUANTITATIVE COMPARISON OF TECHNIQUES. *Anal. Chem., 45(12):2002-2009, Oct. 1973. 17 refs.*

A quantitative comparison of the X-ray spectrometry technique for particulate air pollution was made. X-ray fluorescence spectrometry is best suited to the determination of the elemental composition of air pollution particulate samples because no sample preparation is required for filter collections and 100 sec detection limits are 1 to 100 ng/sq cm for most elements of interest. The technique is nondestructive, and 10 or 20 elements can be measured simultaneously using presently available commercial equipment. The best detection limits are achieved by reducing the background primary radiation scattered into the measuring system by the sample and its filter substrate. Comparisons were made among various excitation sources, X-ray tubes, fluorescers, radioisotopes, and 5-MeV protons, and alpha particles, and between wavelength dispersion using a crystal spectrometer and energy dispersion using a silicon (lithium) solid state detector. Incinerator and other actual samples were analyzed to show application of the method. (Author abstract modified)

32385 **APTIC NO. 54515**

Goldberg, S. A., L. D. Raymond, and C. D. Taylor

BUREAU OF MINES PROCEDURE FOR ANALYSIS OF RESPIRABLE DUST FROM COAL MINES. *Am. Ind. Hyg. Assoc. J., 34(5):200-205, May 1973. 4 refs.*

The Bureau of Mines yearly program of health inspections made mandatory by the Federal Coal Mine Health and Safety Act of 1969 is discussed. The Bureau is required to make four respirable dust health inspections per year. The Act permits the operator s sampling program to be substituted for two of the Bureau s health inspections. Samples of coal mine respirable dust are collected by Bureau of Mines inspections. Samples collected are weighed to determine dust concentration, then sent to the Dust Group, Pittsburgh Technical Support Center at the Bureau of Mines to be analyzed for ash and quartz (silica) content. The number of samples to be analyzed required staffing a laboratory for processing the coal mine respirable dust. The processing of respirable coal mine dust from initial receipt of samples to forwarding of analytical data to the Bureau of Mines computer center at Denver, Colo., is described and a summary of the analytical data is included. (Author abstract modified)

32386 **APTIC NO. 55165**

Hall, H. J.

EVALUATION OF MEASUREMENT METHODS AND INSTRUMENTATION FOR ODOROUS COMPOUNDS IN STATIONARY SOURCES. VOL. II, FIELD TEST-

ING. (FINAL REPORT JUNE 1971 TO DEC 31, 1972). Esso Research and Engineering Company, Linden, N. J., Government Research Lab., Environmental Protection Agency Contract 68-02-0219, EPA-R2- 73-180, Program Element 1A1010, GRU.2DJAB.73, 161p., March 1973. 7 refs.

NTIS: PB 223654/AS

Various instruments which are commercially available for the measurement of hydrogen sulfide and reduced-sulfur odorants in stack emissions were evaluated under field conditions. None of the instruments tested was able to provide a routine analysis for H2S/TRS or for individual S compounds at emission levels in both the refinery and pulp mill tests. The Barton coulometer has given satisfactory field service for years in a number of kraft paper mills. It cannot give absolute values and readings are directly proportional to sample flow rate; the addition of a flow rate controller is recommended. The system cannot be depended on to define the amount or absence of either H2S or sulfur dioxide at 1 ppm or less in the presence of 10 ppm of the other, nor can it measure either total S or total reduced S compounds correctly in the presence of SO2 and COS or CS2. The Bendix gas chromatograph/Flame photometric detector has a more stable zero and superior stability compared with the Barton. With a 1 cc sample, the upper limit of linearity is 30 to 50 ppm for carbonyl sulfide and 80 to 120 ppm for H2S, SO2, and methyl mercaptan. The instrument requires skilled maintenance. The Houston Atlas system for sample pyrolysis and catalytic reduction to H2S is promising for further development and suitable for use with a simple tape sensor; its operation was basically satisfactory. Minimum requirements for future instruments are specified.

32387 **APTIC NO. 54492**

Harrison, A. W.

ATMOSPHERIC THERMAL EMISSION 2.5-4.2 MICRONS. *Boundary-Layer Meteorol., 5(3):365-372, 1973. 7 refs.*

A simple digital recording near-infrared spectrometer was used to obtain intensity-calibrated thermal emission spectra of the lower atmosphere between 2.5 and 4.2 micron, under a variety of atmospheric conditions. In particular, the hydroxyl band was observed at 100 Angstroms spectral resolution to be the major emitter in the 3.5 to 3.8 micron region. With improved spectral resolution and under certain atmospheric conditions, the airglow OH emission and tropospheric pollutants could presumably be observed with this spectrometer. (Author abstract modified)

32388 **APTIC NO. 55261**

Hellman, T. M. and F. H. Small

CHARACTERIZATION OF PETROCHEMICAL ODORS. *Chem. Eng. Progr., 69(9): 75-77, Sept. 1973. 1 ref.*

The absolute and recognition thresholds, odor index, quality, and hedonic tone of 34 petrochemicals were determined using a trained odor panel and a laboratory method. The odor presentation device was an expansion fitting with a 1 in. coupling attached to the end of the Teflon tubing. The expansion fitting is preceded by a glass wool filter which effectively reduces the background noise of the system. The odor fountains are about 14 in. below lengths of 8 in. vent pipe which carry the odorous stream out of the room. Odor is expressed in terms of the odor index which is a ratio of the driving force to introduce an odorant into the air vs. the susceptibility of an odorant to create a recognized response. The odor index provides information pertaining to the potential of a particular odorant to cause odor problems under evaporative conditions. The odor index takes into account the vapor pressure of a compound, which is a qualitative measure of the potential of an odorant to get into the community air, as well as the odor recognition threshold (100%), which is a measure of the potential of an odorant to smell in the community air. The value of odor index of the 34 odorants range from a high of 113 million for ethyl acrylate to a low of 1000 for 2-ethyl hexanol. These values may be used to differentiate between odorants with respect to air pollution control requirements. The odor index does not differentiate between good and bad odor qualities. The odor thresholds for the 34 petrochemicals are reported in ppm by volume. The minimum threshold observed was ethyl acrylate at 0.00036 ppm, and the maximum threshold was acetone at 140 ppm.

32389 **APTIC NO. 54545**

Herzel, F. and E. Lahmann

STUDY CONCERNING THE QUANTITATIVE DETERMINATION OF PESTICIDES IN AIR. *(Beitrag zur quantitativen Bestimmung von Pestiziden in Luft). Text in German. Gesundh.-Ingr., 94(9):275-279, 1973. 8 refs.*

The suitability of absorption and adsorption as sampling methods for the gas chromatographic analysis of low pesticide concentrations in air was studied. For the absorption tests, standard impingers with 300 ml volume were used. Each impinger (two tandem and two parallelly connected ones) was filled with 100 or 50 ml of ethylene glycol. The pesticides lindan, aldrin, dieldrin, and DDT were used for the tests. Absorption in volatile organic solvents did not prove a suitable method for quantitative collection of the insecticides contained in air samples. In further tests the solid adsorbents silica gel, aluminum oxide, and a carrier coated with rigid polyethylene were used. The portable sampling unit by Stratman comprising a membrane pump, gas quantity measuring instrument, or mercury manometer, power supply, and connectors for sampling tubes was selected. In addition to the four mentioned insecticides, the thiophosphoric acid insecticide parathion (E605), the herbicide dichlobenil (2,6-dichlorobenzoic acid nitrile), N-methyl-N-methoxy-Nprime -4- chlorophenylurea and a mixture of chlorinated biphenyls (Clophen A60) were used in the tests. Since the Stratman set-up permits a maximum air throughput of only 200 l/hr, a sampling apparatus was developed for an air throughput of 1.5 cu m/hr and more. The set up comprised a filter with fritted bottom filled with granulated adsorbent. For testing the properties of various adsorbents, two filters were connected in tandem. Polyethylene coated silica gel was the best adsorbent retaining all pesticides in the first filter.

32390 **APTIC NO. 55162**

Hinkley, E. D.

DEVELOPMENT OF IN-SITU PROTOTYPE DIODE LASER SYSTEM TO MONITOR SO2 ACROSS THE STACK. (FINAL REPORT, 11/71-3/73). *Massachusetts Inst. of Tech., Lexington, Mass., Lincoln Lab., Environmental Protection Agency Contract 68-02-0569, EPA-R2-73-218, Program Element 1A1010, 77p., May 1973. 34 refs.*

NTIS: PB 223628/AS

The development and operation of an experimental diode laser system for the monitoring of sulfur dioxide in power plants via across-the-stack in situ measurements are described. Various monitoring schemes were considered, and one was selected which involved a single laser operating pulsed at two different wavelengths approximately 1/cm apart, where the tuning of alternate pulses was accomplished by a third controllable current pulse of relatively long duration. System linearity was confirmed over a wide range of SO2 concentrations, and the system response was also checked for day-to-day reproducibility. Measurements of interference rejection were made using varying amounts of smoke, water vapor, steam, ammonia, and ethylene. As the program progressed, in-stack experiments were performed several times at an oil-burning power plant. At the end of the program, measurements were made at a coal-burning power plant and the resulting SO2 determination was compared with data obtained with a point-sampling monitor. (Author summary modified)

32391 **APTIC NO. 54409**

Hodgeson, J. A., W. A. McClenny, and P. L. Hanst

AIR POLLUTION MONITORING BY ADVANCED SPECTROSCOPIC TECHNIQUES. *Science, 182(4109):248-258, Oct. 19, 1973. 57 refs.*

Spectroscopic techniques offer a means for the direct and continuous detection of pollutants in the gas phase. The absorption or emission characteristics can serve to identify and measure a pollutant. Spectroscopy offers the means for the direct observation of pollutants at a point or over an extended path without the need for any intervening sampling apparatus. Techniques using the ambient temperature chemiluminescent reactions between the gas-phase species are described, including those used for both monitoring and detection. Infrared absorption techniques are discussed, especially the non-dispersive analyzer, which is particularly useful for air pollution monitoring. Absorptive techniques for remote sensing are discussed. The differential absorption and scattering technique, and its variations, are included, along with improvements in the correlation technique. Molecular gas-phase fluorescence, laser- induced fluorescence, microwave spectrum techniques, and ultraviolet approaches are included.

32392 **APTIC NO. 55273**

Huffman, Paul J. and Gabor Vali

THE EFFECT OF VAPOR DEPLETION ON ICE NUCLEUS MEASUREMENTS WITH MEMBRANE FILTERS. *J. Appl. Meteorol., 12(6):1018-1024, Sept. 1973. 8 refs.*

The depletion of water vapor during humidification of filter samples which introduces complications in the determination of ice nucleus concentrations was investigated. The problem can be solved by finding a description for the three dimensional and time dependent variation of the vapor field over the filters during humidification in a processing chamber. The activation spectrum of the particles would need to be known (as a function of temperature and saturation ratio), but no independent determination of these spectra can be made at present. If further measurements show that the slopes of the activation spectra are relatively conservative quantities, the problem may be simplified to a point where an analytic or numerical solution becomes possible. The apparent concentrations of nuclei decreases with increasing concentrations of both hygroscopic particles and of the ice nuclei themselves. The observed dependence of measured nucleus concentrations on sample volume can be adequately explained on the basis of an area of effect model which assumes that ice nucleation is precluded within a certain radius of each vapor sink due to the depression of the local vapor density. The radius of depression is about 760 micron for activated ice nuclei and 0.5 micron for hygroscopic particles (average value for distribution of particle sizes). The relative magnitudes of these radii are in agreement with the fact that the vapor density is depressed to a lower level over ice crystals than over hygroscopic particles. A correction factor can be predicted and applied to the results of any particular measurement in which the numbers of ice crystals are observed on the filter and the numbers of hygroscopic particles are estimated or measured independently. (Author summary modified)

32393 **APTIC NO. 54494**

Hurley, R. G. and E. W. White

RAPID NEW SOFT X-RAY TECHNIQUE FOR DETERMINATION OF QUARTZ IN COAL MINE DUSTS. *Am. Ind. Hyg. Assoc. J., 34(6):229-234, June 1973. 13 refs.*

X-ray fluorescence intensity measurements are made with an x-ray spectrometry at two angular settings on the Si K (alpha) peak to yield values of both peak intensity and peak shift. Made directly on sample filters, the peak Si K (alpha) intensity measures the total amount of silicon present, while the peak shift gives a measure of the ratio of alpha-SiO2 to total silicate silica present in the coal mine dust. The method determines the total amount of silicon in the dust with a precision of about 5% relative. Once the total silicon is determined, the ratio of an alpha-SiO2 to silicate silica is determined from the Si K alpha peak shift to a precision of 5 to 10% relative. From measurements of the total amount of dust on the filter, the total silicon content and the ratio of an alpha-SiO2 to total silicate, the weight percent of quartz is computed. The technique has a sensitivity of better than 1 micrograms alpha-SiO2 on sample filters. This corresponds to a value of 0.25 wt% alpha-SiO2 in a 2 mg dust sample. This method can be used to monitor the amount of quartz in respirable coal mine dust in air. (Author abstract modified)

32394 **APTIC NO. 54316**

Igarashi, Takashi

DETECTION OF AIR POLLUTANTS. *(Taiki osen no kenshutsu). Text in Japanese. Denshi Tsushin Gakkai-shi (J. Inst. Electron. Commun. Engrs. Japan), 56(5):651-656, May 1973. 8 refs.*

The main air pollutants are dusts, sulfur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons. Of these, dusts are created 48% by industrial combustion, 40% by industrial processing, 7% by automobiles, and 5% by solid waste incineration; 75% of the SOx is created by industrial combustion and 22% by industrial processing; 53% of the NOx is created by industrial combustion, and 43% by automobiles; 77% of the CO is created by automobiles and 12% by industrial processing; and 60% of the HC is created by automotive emissions, 32% by industrial processing, and 6% by incineration of solid wastes. Some chemical, physical, and electronic methods of measurements of air pollutants are reviewed. The principles, operation methods, and some chemical reaction process are explained for the electroconductivity method, colorimetry, infrared spectrometry, chemiluminescence, hydrogen flame ionization, and flame photometry. With regards to the application of optoelectronics, correlation spectrophotometry, nondispersion infrared correlation spectroscopy, variable wave semi-conductor laser and laser-radar, the Mie dispersion method, the Raman method the fluorescence method, and the resonance absorption method are discussed. The latter utilizes the characteristic attenuation of light when absorbed by pollutants. The absorption waves of substances are characteristically different; therefore, the wavelength and strength can determine the kind of pollutant gas and its concentration. One resonant absorption method now under development is the method of combining absorption spectrum and pigmentation laser with a broad oscillation gamet.

32395 **APTIC NO. 54337**

Iinoya, Koichi, Kazutaka Makino, Shigeki Toyama, and Akihiro Goto

DEVELOPMENT OF PARTICLE SIZE ANALYZER FOR MIST. *(Misuto ryudo bunsekiki no kaihatsu). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 37(8):858-860, Aug. 1973. 3 refs.*

A new instrument has been developed to measure the concentration and size distribution of mists entrained within a chemical apparatus. The sampling gas containing the mist is fed into the cell and purge gas is spouted from the core to the right, opposite the sampling gas inlet. The large mist particles are trapped within the core, while the smaller particles flow out along the inside of the cell (outside of the core) according to a separation effect along the impacting front of the two streams. The measured collection efficiency using finely classified glass beads indicates that the method may have practical application. The cut size was varied between 10 and several hundred micron by changing the velocity of the purge gas from 2 to 15 m/sec. These data suggest that this instrument may be usefully applied to the analysis of any type of particulate material.

32396 **APTIC NO. 54858**

Ito, Norio

HYDROCARBONS. *(Tankasuiso). Text in Japanese. Kagaku Kojo (Chem. Factory), 17(10):66-68, Oct. 1973. 6 refs.*

Hydrocarbons in the air are a mixture of multi-components having a range of high and low boiling points. Most HC are present in less than several 10 ppb, and where gas chromatography is used, these HC cannot be detected without a concentrating operation. Analysis of HC were carried out by the temperature rising method in order to obtain all the HC present. A concentrated sample was separated by an intermediate column and kept at ordinary temperature and the components trapped in each column were analyzed separately.

32397 **APTIC NO. 54213**

Janssens, M. and R. Dams

DETERMINATION OF LEAD IN ATMOSPHERIC PARTICULATES BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY WITH A GRAPHITE TUBE. *Anal. Chim. Acta, 65(1):41-47, June 1973. 6 refs.*

A procedure for the determination of atmospheric particulate lead by flameless atomic absorption spectrometry is described. Aerosols are collected on 10 cm Whatman 41 filters with high volume pumps. The Pb is removed from 1/8 of the filter by two ultrasonic treatments in 0.1 M nitric acid 10 and 5 min, respectively. Investigations, including comparison with samples preashed at low temperature, indicated that the Pb was completely recovered. Routinely 20 microliter amounts of the solution are injected into a graphite tube and the % absorption at 283.3 nm is measured. The elements normally encountered in atmospheric aerosols do not interfere. The sensitivity for 24-hour samples is 0.01 micrograms/cu m of air. Sampling time can be reduced to a few minutes in urban air when a larger segment of the filter is used and a larger volume is injected. The reproducibility of the complete procedure is 3% for a typical Pb concentration of 0.35 micrograms/cu m. The method was applied to short period variations of the Pb concentration in urban air. (Author summary)

32398 **APTIC NO. 54590**

Jaworowski, Raymond J.

CONDENSED SULFUR TRIOXIDE--PARTICULATE OR VAPOR? J. Air Pollution Control Assoc., 23(9):791-793, Sept. 1973. 5 refs.

The retention of sulfur trioxide and/or reaction products of sulfur dioxide and particulate matter by the various filter media used in IPA/APCO method, WP-50 thimble method, and the ACD/UOP high volume sampling method were measured. The amount of sulfuric acid ranged from 18-78% of the total particulate matter found when sampling emissions from oil fired burners. The amount of SO3 condensed on the various filter media appears to depend only on the fuel burned and the boiler operation, for no significant differences were found among the three sampling systems. The results from the high volume sampler averaged slightly lower, but this is attributed to the difficulty in separating small amounts of H2SO4 from a relatively large 2 sq ft piece of Orlon felt. The significant fact is not the absolute concentration found, but the fact that H2SO4 mist was found on all the filter media tested. The importance of establishing whether or not condensed SO3(H2SO4) is to be considered a particulate is pointed out by the 36% average contribution of this material to the total measured particulate grain loading. As the fly ash emission levels are reduced by air pollution control equipment, this amount of condensed SO3(H2SO4) may equal or surpass the dry particulate contribution and can prevent compliance under existing regulations aimed at particulate control. (Author conclusions modified)

32399 **APTIC NO. 54338**

Kajikawa, Masao

RECENT ATOMIC ABSORPTION SPECTROMETRY IN PETROLEUM INDUSTRY. *(Sekiyu kogyo ni okeru saikin no genshi kyuko bunseki). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 52(556):641-651, Aug. 1973. 63 refs.*

Atomic absorption spectrometry has come into wide use within many industries during the past 10 years because of its high sensitivity, modest time requirements, and relatively low equipment installation costs. While it has also been used for routine analyses in petroleum refineries, it has not yet been authorized as an analytical method for petroleum products. A review of the literature shows the applicability of this method to the analysis of various typical petroleum products. It becomes apparent that the conventional analytical method, which involves the use of flames for atomization, requires scrupulous attention to measurement, although the method is regarded as being nearly perfect. A new method requiring no flame for atomization will be applied to the analysis of food or environmental problems, in that its sensitivity is 100 to 1000 times greater than that of the conventional method.

32400 **APTIC NO. 55018**

Kannappan, A.

DEVELOPMENT OF A GAS SAMPLER FOR CUMULATIVE SAMPLING IN TWO-STROKE ENGINES. *Preprint, American Society of Mechanical Engineers, New York, 15p., 1973. 15 refs. (Presented at the American Society of Mechanical Engineers. Diesel and Gas Engine Power Conference and Exhibit, Washington, D. C., April 1-4, 1973.)*

Data obtained from a blow-down simulator was used to develop a blow-down actuated sampler for investigating the scavenging process in two-stroke engines. The design incorporates control of back pressure which is brought about externally and not through accumulation of samples. The external opposing pressure acts on the face of a cylindrical dead-weight which is attached to the mushroom valve head with a tubular valve-stem. The movement of the valve-element is guided at two places, one at the stem near the valve seat and the other at the dead-weight. A polythene diaphragm is fixed to the face of the dead weight and to the guide piece in order to prevent leakage past the the dead-weight guide. The external pressure acts on the diaphragm and provides the necessary force opposing valve-element motion. The valve-element displacement is recorded by means of an inductive type displacement transducer mounted at the rear end of the sampler valve assembly.

32401 **APTIC NO. 54775**

Katz, Morris

INTERSOCIETY COMMITTEE METHODS OF AMBIENT AIR SAMPLING AND ANALYSIS. *Health Lab. Sci., 10(3):211-213, July 1973. 1 ref.*

The Intersociety Committee of Methods of Ambient Air Sampling and Analysis has published its collection of methods which have been adopted as tentative. A total of 68 tentative methods have been published so far; as yet, no method has completed the cooperative test program needed to take it from the tentative category into the recommended category. Each method is identified with a number showing: its pollutant identification under the SAROAD system; the chronological order of adoption of this method for the particular pollutant; the year in which it was adopted; and a designation of tentative. The Intersociety Committee was organized in March 1963 to produce a recommended method of sampling and analysis for routine investigations of air pollution. Each of the 14 participating organizations appoint a representative to the committee, which serves as a policy-making and editorial board; coordination is maintained between the committee and the EPA. Until 1971, the Committee was concerned only with methods for ambient air sampling and analysis; during 1971, the scope was enlarged to include methods for air pollution source sampling and analysis. At the time of publication of the 11th group of methods, 44 other methods were in various stages of consideration.

32402 **APTIC NO. 55063**

Kaye, Wilbur and A. J. Havlik

LOW ANGLE LASER LIGHT SCATTERING--ABSOLUTE CALIBRATION. *Appl. Opt., 12(3):541-550, March 1973. 39 refs.*

A new method for the calculation of the Rayleigh factor from low angle light scattering measurements has been developed. This method does not require a uniform intensity illuminating beam, thus allowing efficient utilization of all of the beam from a focused laser source. Scattering volume is very small, reducing the sample volume and interference from contaminated particles. All the parameters necessary for the calculation of the Rayleigh factor (including the exact dependence on the sample refractive index) are measurable, so absolute calibration is possible. The overall error is estimated to be less than 2.3% under specified conditions. Measurements are possible at scattering angles as small as 2 deg, obviating the need for angular extrapolations in the determination of the molecular weight of most dissolved samples. Rayleigh factors at 22 C, 633 nm, and a scattering angle of 4 deg, were found to be 0.907, 2.56, 12.15, and 0.00001345 cm-l for water, methanol, benzene, and toluene, respectively. (Author abstract)

32403 **APTIC NO. 55191**

Kelleher, Carolyn

SIZE-SELECTIVE SAMPLING ANNOTATED BIBLIOGRAPHY. *Preprint, Technical Information Center, 29p., April 1973. 87 refs.*

An annotated bibliography of the state of the art of size selective sampling combined with high volume sampling is presented. Such instruments are to be used only for ambient air sampling with flow rates of 30-100 cfm. Only the literature in English from 1967 to date was searched.

32404 **APTIC NO. 54861**

Kikuchi, T., T. Abe, and M. Sone

DETERMINATION OF TRIMETHYL AMINE IN WASTE GASES. *(Haigasu chu trimethylamine no sokuteiho ni tsuite). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Pref. Pollut. Contr. Tech. Center Rep.), no. 1:16-19, May 1973. 1 ref.*

A method of preparing samples for testing trimethyl amines contained in waste gases was discussed. Trimethyl amines were determined by gas chromatography. Volatile amines contained in waste gases were collected by absorptionn 1/10 hydrochloric acid and then neutralized by the addition of caustic kali. Provided the liquid was kept cooled with ice, no substantial loss of amines was observed and the absorption ratio was satisfactory. An application of this method to sample gas from a rendering cooker showed the calibration curve on the gas chromatography. No peak for the amines appeared.

32405 **APTIC NO. 54402**

Klauber, Gary M.

ULTRAVIOLET PHOTOGRAPHY OF SULFUR DIOXIDE PLUMES. *Environ. Sci. Technol., 7(10):953-954, Oct. 1973. 7 refs.*

A method of imaging normally invisible sulfur dioxide plumes on photographic film, using the sun's ultraviolet light in the absorption band of SO2 (232-315 nm), is described. The apparatus is basically a camera body fitted with a lens which passes UV light and an interference filter which admits only those wavelengths absorbed by SO2. The absorption bands of carbon dioxide, carbon monoxide, oxygen, water vapor, nitrous oxide, ammonia, and nitric oxide fall outside the SO2 band of interest; however, in the region of ultimate plume rise in urban atmospheres, nitrogen dioxide interference may be as much as 10%, due to the rapid oxidation of NO to NO2 in the plume. The usefulness of the apparatus was demonstrated with a series of pictures taken of a power plant near Baltimore.

32406 **APTIC NO. 54777**

Kneip, T. J., R. S. Ajemian, J. R. Carlberg, J. Driscoll, J. L. Moyers, L. Kornreich, J. W. Loveland, and R. J. Thompson

TENTATIVE METHOD OF ANALYSIS FOR NICKEL CONTENT OF ATMOSPHERIC PARTICULATE MATTER BY ATOMIC ABSORPTION SPECTROSCOPY. *Health Lab. Sci., 10(3):221-225, July 1973. 7 refs.*

A new method is discussed for determining the nickel content of atmospheric particulate matter by atomic absorption spectroscopy. Nickel in quantities of 0.1 to 20.0 micrograms/ml of solution can be detected by this method, as can atmospheric concentrations of 0.005 micrograms/cu m. A minimum sample volume of 2000 cu m of air is required. Possible sources of interference include silica extracted from the glass fiber filter and the collected particulate matter, antimony and/or beryllium, and the presence of other metals. An average standard deviation of 13% was obtained in the determination of atmospheric nickel at normal urban concentrations by a nearly identical method. The required apparatus includes membrane filters, glass fiber filters, various items of glassware, acetylene gas, an air supply, an atomic absorption spectrophotometer, a centrifuge, a copper hollow cathode lamp, and a low temperature Asher-Tracerlab LTA-600. The required reagents are concentrated and dilute hydrochloric acid, concentrated nitric acid, nickel shot, perchloric acid, perchloric-nitric acid mixture, and distilled water. The sample preparation procedure and method of analysis are discussed in detail, along with the necessary standards, calibrations, and calculations. Untreated filter samples may be stored indefinitely, and acid extracts may be stored for 1 month.

32407 **APTIC NO. 54778**

Kneip, T. J., R. S. Ajemian, J. R. Carlberg, J. Driscoll, J. L. Moyers, L. Kornreich, J. W. Loveland, and R. J. Thompson

TENTATIVE METHOD OF ANALYSIS FOR COPPER CONTENT OF ATMOSPHERIC PARTICULATE MATTER BY ATOMIC ABSORPTION SPECTROSCOPY. *Health Lab. Sci., 10(3):226-230, July 1973. 5 refs.*

A new method for the determination of copper in atmospheric particulate matter involves the use of atomic absorption spectroscopy. Copper in quantities of 0.05 to 20.0 micrograms/ml of solution can be detected by this method, as can atmospheric concentrations of 0.005 micrograms/cu m. A minimum sample volume of 2000 cu m of air is required. Possible sources of interference include silica extracted from the glass fiber filter and the collected particulate matter, and the presence of other metals. A relative standard deviation of 9% was obtained in the determination of atmospheric copper at normal urban concentrations by a nearly identical method. The required apparatus includes membrane filters, glass fiber filters, various items of glassware, acetylene gas, an air supply, an atomic absorption spectrophotometer, a centrifuge, a copper hollow cathode lamp, and a low temperature Asher-Tracerlab LTA-600. The reagents required are hydrochloric acid, concentrated nitric acid, reagent grade copper, perchloric acid, perchloric-nitric acid mixture, and distilled water. The procedure and method of analysis are discussed in detail, along with the necessary standards, calibrations, and calculations. Untreated filter samples may be stored indefinitely, and acid extracts may be stored for 1 month.

32408 **APTIC NO. 54913**

Kovalick, Walter W., Jr.

THE DEMAND FOR AIR MONITORING INSTRUMENTS. *Pollut. Eng., 5(9):37-40, Sept. 1973.*

A tabular summary by state of the theoretical and real demands for air quality monitoring instruments to measure high volume particulates, trace particulates, sulfur dioxide, carbon monoxide, oxidants, and nitrogen dioxide is presented based on implementation plans submitted to the Environmental Protection Agency. The theoretical demand for particulate measurements projected by the states is over 1200 instruments which substantially exceeds the 232 instruments necessary to meet EPA requirements. This demand is also much greater than that for any other instruments, except for those measuring sulfur dioxide. The fact that sulfur dioxide is one of the more familar pollutants shows up in a greater theoretical demand for it than for any other single gas sampler. Only 20 continuous carbon monoxide instruments are required by EPA guidelines, while states are planning to buy about 10 times that number (193). The EPA required demand for all monitoring instruments is estimated at $1.114 million, while the state and local governments plan to make purchases amounting to $4.718 million. Estimation of the replacement market fixed one to two years as the time line for mechanical obsolescence and three to five years for technological obsolescence. Industrial demand is also noted.

32409 **APTIC NO. 54776**

Kupel, R. E., M. M. Braverman, J. M. Bryant, H. E. Bumsted, A. Carotti, H. M. Donaldson, L. Dubois, and W. W. Welbon

TENTATIVE METHOD OF ANALYSIS FOR MOLYBDENUM CONTENT OF ATMOSPHERIC PARTICULATE MATTER BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *Health Lab. Sci., 10(3):218-220, July 1973. 5 refs.*

A new method is discussed for determining the molybdenum content of atmospheric particulate matter by atomic absorption spectrophotometry. The molybdenum is reacted with 4-methyl-1,2-dimercaptobenzene to form a green compound which is extracted with methyl isobutyl ketone. This extract is analyzed with an atomic absorption spectrophotometer. The detection limit for molybdenum in aqueous solutions is about 0.03 micrograms/ml, that for molybdenum in the organic phase is lower. A molybdenum concentration of 0.15 micrograms/ml of air can be analyzed from a 20 cu m sample. No optical interferences are encountered, although interferences may be encountered if an air-acetylene flame is used to determine the molybdenum. The apparatus includes an atomic absorption spectrophotometer, acetylene gas, nitrous oxide gas, 125-ml separatory funnels, various types of glassware, and an automatic shaker. The required reagents are a standard molybdenum solution, hydrochloric and nitric acids, potassium iodide, sodium thiosulfate, and dithiol reagent. The preparatory and analytical procedures are discussed in detail, along with the necessary calibrations and calculations. Molybdenum collected on solid filter media can be stored indefinitely.

32410 **APTIC NO. 54546**

Lahmann, E., F. Nietruch, and M. Drews

COMPARATIVE PHOTOMETRIC DETERMINATION OF ARSENIC IN ATMOSPHERIC DUST. *(Vergleichende photometrische Arsen-Bestimmungen in atmosphaerischem Staub). Text in German. Gesundh.-Ingr., 94(9):258-261, 1973. 14 refs.*

The photometric diethyl dithiocarbamate method as described by Auermann and Wabra proved very suitable for arsenic determinations in atmospheric dust. Through modification of the geometry of the absorption vessels the detection limit could be lowered. The method requires five solutions. Solution I consists of one part of 65% nitric acid plus one part 70% perchloric acid plus two parts 96% sulfuric acid. For solution II one gram AgDDTC is dissolved in 200 ml pyridine. Solution III is a 15% aqueous solution of potassium iodide. For solution IV 2 g of copper sulfate are dissolved in water. For solution V 0.33 g zinc chloride are dissolved in 100 ml 37% hydrochloric acid. After preparation of the samples, the arsenic concentration is photometrically measured at a wave length of 530 nm. The dusts for the analysis were sampled with a high volume sampler and retained on glass fiber filters. With a one-hour sampling time the detection limit was 0.01 micrograms As/cu m air. Arsenic determinations in the air of Berlin-Dahlem, in a residential section on the southwestern outskirts of the city in the fall of 1971 yielded an average arsenic concentration of 0.1 micrograms/cu m. The sampling time was 24 hours. In winter of 1972/1973 1-hour samples were taken with a high volume sampler in the vicinity of a lead plant. In 17 samples taken on 14 different days, the arsenic concentration was determined. The values were between 0.12 to 1.93 micrograms As/cu m air, on the average 0.57 micrograms/cu m. These measurements were used for determination of the standard deviation of the described method which was plus or minus 0.028 micrograms As/cu m air.

32411 **APTIC NO. 54956**

Langer, G.

ANALYSIS OF RESULTS FROM SECOND INTERNATIONAL ICE NUCLEUS WORKSHOP WITH EMPHASIS ON EXPANSION CHAMBERS, NCAR COUNTERS, AND MEMBRANE FILTERS. *J. Appl. Meteorol., 12(6):991-998, Sept. 1973. 20 refs.*

Results from the Second International Ice Nucleus Workshop are analyzed with emphasis on expansion chambers, NCAR counters, and membrane filters. The Second International Workshop on Condensation and Ice Nuclei, held at Ft. Collins, Colo., in 1970, provided approximately 10,000 measurements by ice nucleus counters of natural and artificial aerosols, with the counters operating under well-defined conditions. Relevant data on nucleus aerosol size and concentration, and the properties of related condensation nuclei were provided. A first review of the data showed a number of serious discrepancies between the various instruments. A detailed analysis of data is presented from 10 instruments, and the origins of the discrepancies are clarified with relation to the degree of supersaturation and its relationship to the concentration of condensation nuclei during cloud formation. Different instruments respond differently to these variables but the present results make it evident that meaningful results can be obtained with the counters now available. (Author abstract modified)

32412 **APTIC NO. 54952**

Marotz, Glen A. and Jerry C. Coiner

ACQUISITION AND CHARACTERIZATION OF SURFACE MATERIAL DATA FOR URBAN CLIMATOLOGICAL STUDIES. *J. Appl. Meteorol., 12(6):919-923, Sept. 1973. 13 refs.*

A sampling and analysis scheme is presented and briefly illustrated for examination of the type, amount, and degree of areal contiguity among surface materials in urban areas. Such data are necessary to understand and model the spatial and temporal effects of urban places on atmospheric variables. Medium scale aerial photographs are used as the data source; surface material information is extracted using a systematic grid cell routine. Percent coverage values are computed and a linkage technique is used to compare areal contiguity of materials within and among five selected eastern Kansas cities. Results suggest that the amount of vegetated surface within a city has been grossly underestimated. Materials tend to aggregate by types in essentially bimodal fashion. Materials within each modal category change with city size. Geographic location affects the nature of the surface material matrix. (Author abstract)

32413 **APTIC NO. 54896**

Matsui, Shigeo

THE PRESENT CONDITIONS AND FUTURE OF BAD ODOR MEASURING METHODS. *(Akushu sikuteiho no genjo to shorai). Text in Japanese. (Sangyo to Kankyo (Ind. Environ.), 2(11):55-64, Nov. 1973.*

The instrumental analysis of odor pollutants espresses concentrations of ammonia hydrogen sulfide in objective physical units. Control standards are based on the existing regulations. On the basis of these laws, it it assumed that 100% of NH3 gas present in the air in a ppm unit is collected on the filter paper, and 100% of it is dissolved in the washing water. Such an ideal collection is possible only for a single component in very limited conditions, and this type of measurement is impossible under field conditions. The determination of a low concentrate of H2S, the problem of adsorption on the inner walls of the collecting container, adsorption in the inside of the sampling tube, and the hysteresis of absorption make it impossible to calculate 100% of the odor component through gas chromatography. During all operations, the sample should be tested using a known concentration of a standard gas.

32414 **APTIC NO. 54856**

Matsumura, Ikutoshi

BAD ODORS. *(Akushu). Text in Japanese. Kagaku Kojo (Chem. Factory), 17(10):69-71, Oct. 1973. 5 refs.*

A measurement method for the odorous compounds methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethyl amine is described. Equipment used to measure CH3SH, H2S and (CH3)2S includes a 1 l borosilicate glass gas sampling container with a capillary tube, a sample concentrating tube, a gas chromatographic separating tube equipped with a thermocouple, and a gas chromatographic analyzer with a flame photometric detector and a hydrogen ionization detector. The gas chromatographic column is filled with a brown diatomaceous earth carrier covered with (cyanoethoxy) propane after acid and dimethyl chlorosilane treatment. Sampling for (CH3)3N is done with a glass fiber filter, a gas chromatographic analyzer, and a column filled with a white diatomaceous earth covered with 15% glycerol, 5% tetraethylene pentamine, and 2% sodium hydroxide.

32415 **APTIC NO. 55111**

Matz, George J.

RECENT ADVANCES IN ECHELLE SPECTROMETER ANALYSIS. *Am. Lab., 1973:1-7, March 1973. 15 refs.*

Echelle grating spectrometers offer the analytical and the research laboratory several distinct advantages. Greater energy throughout is the principal advantage. Others include a stigmatic optical system with reduced coma and a more compact focal plane, which improves stability and reduces cost. A more compact focal curve permits simultaneous multichannel analysis by employing optical encoding techniques. An echelle is a special type of diffraction grating having broad flat grooves ruled with extremely high optical precision. A modular spectrometer has been designed specifically to take full analytical advantage of the echelle concepts. The f/10 echelle has a 0.75 m focal length, a reciprocal linear dispersion of 0.65 angstroms/mm, and a resolution of 0.0006 A at 2000 A. The instrument is capable of doing simultaneous multielement analysis. The instrument will accept traditional atomization sources such as burners and arc/spark stands. More promising devices as plasma jets and other nonflame techniques are preferred. The instrument can utilize both a photographic and a photoelectric detection system. The photographic accessory is used primarily for qualitative determinations. The compact, two dimensional echelle spectrum is suitable for qualitative purposes. Echelle spectrometers can use an appropriate continuum source as a practical alternative to hollow cathode lamps. The echelle is the only high resolution spectrometer that requires only a laboratory bench instead of a laboratory. As a consequence of the reduced size, the optics are less susceptible to instabilities such as thermal drift and vibrations.

32416 **APTIC NO. 54928**

McCreight, C. R. and C. L. Tien

LOW RESOLUTION INFRARED DERIVATIVE SPECTROMETRY FOR SOURCE CONCENTRATION MONITORING. *J. Quant. Spectro. Radiative Transfer., 13(11):1143-1159, 1973. 19 refs.*

An active pollutant source monitoring system was developed using derivative techniques and a low resolution infrared spectrometer. Derivative spectrometry uses periodic modulation and selected spectral information to evaluate species concentration and to reduce interference. The system includes narrow band radiation expressions and a prediction of interference effects. An experimental optical pathlength sensitivity of about 0.001 atm cm of nitric oxide is achieved and first overtone component sensing is found to be superior to fundamental component sensing. Although minimum detectable cL levels were about the same for each approach, the 1 Hz signal was much more responsive to cL level changes particularly for low levels, and carbon monoxide carbon dioxide interference effects were substantially less at the overtone frequency. Sensing at 0.5 hz did produce large signals, but the no-gas amplitude measurement introduced uncertainties. The sensitivity range measured with small geometrical pathlength is consistent with typical combustion exhaust species levels. A somewhat refined, compact derivative spectrometer of this type would be a valuable tool for roadside or on site monitoring of concentrations of the pollutants NO and CO, and possibly of other species as well. (Author abstract modified)

32417 **APTIC NO. 55102**

McKee, Herbert C.

EMISSION MONITORING REQUIREMENTS. *Air Pollution Control Assoc., Pittsburgh, Pa., Proc. Spec. Conf. Des. Oper. Maint. High Effic. Contr. Equip., St. Louis, Mo., 1973, p. 129-134. 4 refs. (March 29-30.)*

The necessity of emission monitoring requirements is discussed. Monitoring of emissions from stationary sources is required to show compliance with regulations and also to aid in process control. Without suitable measurements through monitoring or other means, adequate control to maintain the quality of the environment is impossible. Despite this pressing need, technology and experience in this field are limited, and better methods are needed. Most existing methods require manual sampling and analysis, which increases the cost and imposes a serious time delay before results are obtained. Texas and other states have adopted regulations that require emission measurement, and some progress has been made in adapting available instruments for use in meeting these legal requirements. New techniques and instruments are beind developed, and further progress can be anticipated. (Author abstract modified)

32418 **APTIC NO. 54586**

Meszaros, Lajos

METROLOGIC DECISIONS IN CLEAN AIR MAINTENANCE. *(Merestechnikai dontesek a levegotisztasag vedelmeben). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):204-208, 1973. 4 refs.*

A reductive mathematical method as a possibility for the detection of anomalously emitted pollutants is given by relationships deriving from the theory of recurrent processes, and by the determination of stochastic decisions based on the results of concentration measurements. The determination of the reliability of reductive and stochastic decisions is necessary in many cases in the chemical industry where the emission sources often are not point sources, and therefore the emissions can be estimated only by concentration measurements at a certain distance of the emission source. Pollution recording instruments may not record actual emission and concentration levels in excess of a standard value due to the sampling site not being chosen properly, and they may also record nonexistant emission anomalies as emission anomalies due to anomalous concentration levels occurring on the sampling site. Formulae for stochastic decisions regarding the occurrence of anomalous pollutant concentrations on the sampling site are given for one and more simultaneously recording instruments.

32419 **APTIC NO. 54496**

Mozell, Maxwell M. and Morris Jagodowicz

CHROMATOGRAPHIC SEPARATION OF ODORANTS BY THE NOSE: RETENTION TIMES MEASURED ACROSS IN VIVO OLFACTORY MUCOSA. *Science, 181(4106):1247-1249, Sept. 28, 1973. 10 refs.*

To study the chromatographic separation of odorants by the nose, the standard column of a gas chromatography was replaced with the olfactory sac of an intact frog. The inlet port of the gas chromatograph was connected to the frog s external naris and the frog s internal naris was connected to the chromatograph s flame ionization detector; a direct connection was also made from the inlet port and the detector. Each of the following was odorants then presented at different times to each of seven frogs: octane, nonane, d-liomonene, heptaldehyde, butyl acetate, amyl acetate, 4-heptanone, geraniol, butanol, benzaldehyde, methyl benzoate, and furfurol. The retention time of each odorant varied from animal to animal, but within one animal, the odorant retention times were highly consistent in almost all cases. With the exception of butyl acetate and heptaldehyde, concentration did not appear to be a major determinant of relative retention time across the mucosa. The range of different relative retention times produced by the different odorants showed an approximate 220-fold increase from the shortest to the longest, with good distribution in between. Thus the molecules of different odorants appear to migrate at significantly different rates across the in vivo olfactory mucosa of the frog. These results indicate that some of the same properties which underlie and characterize the chromatographic behavior of a Carbowax column may also underly and characterize the observed chromatographic behavior of the olfactory mucosa; this chromatographic differentiation may be one of the mechanisms underlying olfactory discrimination.

32420 **APTIC NO. 54199**

Ooura, Masahiro

AUTOMATIC CONTINUOUS ANALYSIS OF NITROGEN OXIDES. *(Chisso sankabutsu no jidoo renzoku bunsekihoo). Text in Japanese. Preprint, Research Group of Environmental Techniques of Japan, Osaka, p. 57-67, 1973. (Presented at the Seminar on Environmental Techniques, Osaka, Japan, May 16-17, 1973.)*

Nondispersive infrared analysis, chemiluminesence, ultraviolet absorption analysis (including single wavelength colorimetry, double wavelength colorimetry, and correlation spectrometry), electric quantitative analysis, constant electric field electrolysis, mass spectrometry, photoionization, laser and radiation resonance absorption, laser Raman scattering, and vibrational luminescence methods can be used to analyze nitrogen oxides continuously. Sensitivity of these methods, interference by other gases, and shortcomings and advantages of these methods are discussed.

32421 **APTIC NO. 54931**

Perry, R. and J. D. Twibell

A TIME BASED ELUTION TECHNIQUE FOR THE ESTIMATION OF SPECIFIC HYDROCARBONS IN AIR. *Atmos. Environ., 7(10):929-937, 1973. 1 ref.*

The difficulties involved in collecting and analyzing individual volatile components in street air samples are discussed. It is shown that at elevated temperatures, a carefully timed elution of hydrocarbons adsorbed onto chromosorb, releases a fixed proportion of each compound. This principle has been used in developing a rapid means of quantitative analysis for the individual compounds concerned. This technique can be used to determine the relative contributions of several combustion sources to the total hydrocarbon levels occurring in street air. The period selected for timed elution is critical. This was investigated within the range 1-20 sec. Shorter times elute much less material and therefore represent little advantage over direct air sampling. Longer periods elute more material but there is the danger that the plug of eluted material may be sufficiently long so as to cause peak broadening and inhibit resolution [illegible] the gas chromatographic stage. At 5 sec a plug of 3.3 cu cm/sec is produced at a carrier gas flow rate of 40 cu cm/min, which is enough to sweep the whole gaseous content of the tube into the gas chromatograph inlet. The temperature selected for desorption is related to the volatility of the range of compounds being examined and is determined by the column of air sampled and the size of the tube used. (Author abstract modified)

32422 **APTIC NO. 54328**

Pluss, Dawn H. and W. Strauss

A SIMPLE LOW COST SAMPLER FOR USE IN REMOTE LOCATIONS. *Atmos. Environ., 7(6):657-658, June 1973. 4 refs.*

A simple low cost sampler for use in remote locations was developed. It operates off a portable power supply and was used to determine atmospheric dust concentrations at sites surrounding a cement factory and a major road. The sampler consists of a membrane filter in a conventional holder, attached through a variable area flowmeter to an automobile diaphragm fuel pump. It is powered by a 12 volt car battery. For consistent, meaningful results, a large number of measurements at each location is desirable, but if an indication of a distribution pattern and approximate concentrations are required, the sampler provides an inexpensive and convenient method. Calibration is described. (Author abstract modified)

32423 **APTIC NO. 55267**

Rauws, A. G., M. Olling, and A. E. Wibowo

THE DETERMINATION OF FLUOROCHLOROCARBONS IN AIR AND BODY FLUIDS. *J. Pharm. Pharmacol., 25(9):718-722, 1973. 10 refs.*

A gas chromatographic method for the separation and determination of fluorochlorocarbons (FCC) is described. Porapak Q was used as the solid phase. The column temperature was 150 degrees. The compounds were detected by means of a tritium foil electron capture detector. The retention times under the conditions used were 1, 2, 4, and 7.5 min for the FCC s 11, 114, 12, and 113 respectively. Concentrations in air were determined directly, the concentrations in body fluids were determined by means of head space analysis. The detection limits for the various FCC vary between 0.5 and 35 pg. The method was applied in determining FCC concentration in air and in rat blood in vivo. (Author abstract)

32424 **APTIC NO. 55304**

Regulska, Hanna, Jan Wielowieyski, and Bogumila Nawrocka-Fuchs

STUDY ON THE ODORIZATION OF GASES WITH DICYCLOPENTADIENE. *(Doswiadczenia w zakresie nawaniania gazu dwucyklopentadienem). Text in Polish. Gaz. Woda Tech. Sanit. (Warsaw), 47(6):209-213, 1973. 16 refs.*

The value of odor intensity equals 1 divided by the odor threshold multiplied by 10,000. The content of coal gas odors in the coal gas emitted in Warsaw in 1965 by a municipal gas works is given. Investigation of the microcomponents revealed a content of 5.4 g benzole/cu m. The other compounds were: N-heptane--0.420, cyclopentadiene--0.310, cyclohexane--0.160, styrene--0.130, and indene--0.091/g cu m. Dicyclopentadiene and its mixtures with benzene are the most efficient odor bearers. An eutectic mixture of dicyclopentadiene with benzene with a coagulation temperature of approximately -15 C was prepared. A satisfactory chemical stability was obtained for sulfur compounds below 1% by weight, as well as a satisfactory viscosity and elasticity of the mixture vapors, in keeping with the standards. The mixture contains over 80% dicyclopentadiene by weight, and its symbol is DCP. Odor tests were performed to determine odorization of given quantities of clean air, odorization of earth gas with increasing doses of odorant, and odorization of air containing 1 to 2% earth gas. Air was taken by the blowing engine under a 1.5 atm pressure. The air was first purified in the absorber with activated coal and let to flow through the gas meter with a velocity of 5 cu m/hr. It was injected by means of a medical needle and conveyed by means of a micropump dosing minimal odorant doses of 0.01 cu/cm, changing the dosing frequency. The odor intensity was determined by means of a 5-level odor scale. The odorized gas was conveyed from the 10 to 20 l installation to a 1 cu m sampling container, filled with clean air. The container was closed for 24 to 48 hr to help diffusion of gas with air. After opening the faucet, the odor intensity was checked. The efficient gas quantities were determined in a 20 cu m odor chamber. Calculated odorant quantities were vaporized in the chamber s central point with an accuracy up to 0.001 cu cm. Odor intensity was measured by users through a questionnaire, and 60-80% of the users detected the odors easily. Only 3% failed to detect the odor. Repeated investigations conducted with different gaseous mixtures indicated that DCP gives the best results, is the most efficient for all odor-testing purposes, and is most easily detectable.

32425 **APTIC NO. 55068**

Rhodes, J. R.

ENERGY-DISPERSIVE X-RAY SPECTROMETRY FOR MULTIELEMENT POLLUTION ANALYSIS. *Am. Lab., 10p., July 1973. 9 refs.*

X-ray emission analysis is nondestructive, requires little or no sample preparation, is highly sensitive and fast, and allows for simultaneous multi-element analyses. The x-ray line spectra having energies characteristic of the elements are excited in the analytical specimen by other x-rays or by charged particles such as electrons or protons. The detected count rate of characteristic x-rays is proportional to the weight fraction of the element, with the useful elemental range being from sodium to uranium. The instrumentation used in the work described is described in terms of source of excitation, geometry, and electrons. The main data processing requirements are: to obtain the true characteristic x-ray counts and to convert the characteristic x-ray intensities into elemental concentrations. Thin specimens offer several advantages over bulk specimens in terms of analysis, and pollutants either come as thin specimens or can easily be prepared as thin specimens. The analysis of thin specimens is discussed in terms of thin-specimen criterion, the linearity of response and absence of interelement effects, fluorescent-to-scattered ratio, particle size effects, and practical deposits. No substrate is ideal for all purposes, but the advantages of thin-specimen analysis can be exploited if both specimens and standards are prepared as deposits on filter paper or membrane filters. The most widely applicable standards are aqueous-solutions deposited on either Whatman 41 cellulose fiber or Millipore cellulose membrane. The basic sensitivity, precision, and accuracy obtainable are discussed and some typical spectra of air and water pollution are presented.

32426 **APTIC NO. 54377**

Robertus, Robert J. and Michael J. Schaer

PORTABLE CONTINUOUS CHROMATOGRAPHIC COULOMETRIC SULFUR EMISSION ANALYZER. *Environ. Sci. Technol., 7(9):849-852, Sept. 1973. 11 refs.*

An instrument capable of automatic continuous quantitative analysis of sulfur compounds in stack gases was developed and tested for 1 mo in a kraft paper mill. The instrument is portable and uses a chromatograph column for separation and a bromine titration cell for detection of the S compounds. Gas samples can be analyzed for sulfur dioxide, hydrogen sulfide, and methyl hydrosulfide once every 10 min. Concentrations of 0.1 ppm for CH3SH, 0.2 ppm for H2S, and 1.0 ppm for SO2 can be detected. A multistack sampling accessory for the unit was built and successfully tested. (Author abstract)

32427 **APTIC NO. 54945**

Robinson, J. W. and D. K. Wolcott

CALIBRATION TECHNIQUES USED IN THE DIRECT DETERMINATION OF ATMOSPHERIC METALLIC POLLUTANT LEVELS (10 TO THE -10 POWER TO 10 TO THE -12 POWER G). *Anal. Chim. Acta, vol. 66:333-342, 1973. 9 refs.*

Techniques for calibrating atomic absorption systems at low concentration levels down to 10 to the -13th power g were investigated. The most reliable method of those examined was the direct injection of a liquid drop (microliter quantities) containing the metal of interest at the ng/ml level. The dilute solutions were made up immediately before use to avoid problems involved in plating out of the metal on the surface of the container. The technique can be used to calibrate the signals obtained from ambient air samples. (Author summary)

32428 **APTIC NO. 54507**

Roques, Y. and J. Mathieu

RAPID DETERMINATION OF SMALL TRACE QUANTITIES OF LEAD IN ATMOSPHERIC AEROSOLS BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Determination rapide d ultratraces de plomb dans les aerosols atmospheriques par spectrophotometrie d absorption atomique sans flamme). Text in French. Analusis, 2(7):481-484, July-Aug. 1973. 14 refs.*

A rapid method for the determination of microquantities of lead in atmospheric aerosols by flameless atomic absorption spectrophotometry is described. Aerosol sampling is done by means of a cascade impactor on a tantalum membrane. A sampling time of 6 min is sufficient even for lead concentrations as low as 0.01 micrograms/cu m. Flameless atomic absorption spectrophotometric analysis is done directly in a Perkin-Elmer spectrophotometer model 403 with a burner replaced by a special atomizing cell. The sensitivity of the atomic absorption spectrophotometric determination is 0.00004 micrograms/% A. The reproducibility ranges from 6 to 10%. The calibration is done by comparison of single analyses performed in a day with chemical analyses of lead sampled on a filter during the same time.

32429 **APTIC NO. 54457**

Salzano, Francis J., Andrew M. Davis, Hugh S. Isaacs, and Leonard Newman

SULFUR OXIDE ACTIVITY MEASUREMENT. *(Atomic Energy Commission, Washington, D. C.) U. S. Pat 3,718,546. 4p., Feb. 27, 1973. 5 refs. (Appl. Dec. 9, 1971, 10 claims).*

An electrochemical approach to the measurement of sulfur dioxide concentration in an oxygen-bearing gas is described. It consists of a sulfur oxide activity meter for measuring directly in an electrochemical cell the changes in SO2 activity in a sample gas being supplied continuously to the cell. The electrolyte consists of molten fused lithium sulfate, potassium sulfate, and sodium sulfate. The sample gas forms part of one electrode while a reference gas having a fixed concentration of SO2 forms part of the other electrode. The methods overcome many of the disadvantages of previous ways of measuring the SO2 content of an oxygen bearing gas such as air or oxygen. In other methods the presence of other ingredients such as nitrogen oxide and carbon dioxide tended to hinder or at least complicate results. Those methods rely on sophisticated techniques and are relatively expensive. (Author abstract modified)

32430 **APTIC NO. 54779**

Sawicki, E., P. R. Atkins, T. Belsky, R. A. Friedel, D. L. Hyde, J. L. Monkman, R. A. Rasmussen, L. A. Ripperton, J. E. Sigsby, and L. D. White

TENTATIVE METHOD OF FLUORIMETRIC ANALYSIS FOR ALIPHATIC HYDROCARBONS IN ATMOSPHERIC PARTICULATE MATTER. *Health Lab. Sci., 10(3):231-240, July 1973. 4 refs.*

A new method for the fluorimetric analysis of aliphatic hydrocarbons in atmospheric particulate matter is discussed. The benzene-soluble fractions of airborne particulate extracts are separated along with standard solutions of n-docosane on silica gel thin-layer chromatographic plates impregnated with rhodamine 6G. The alkane concentrations in the benzene soluble fraction are estimated in terms of the docosane standard. This method is simpler, faster, more economical, and more sensitive than other methods. The range of analysis is 0.1 to 20 micrograms of docosane, and adequate analysis requires 3.5 cu m of urban air or 20 cu m of nonurban air. Contamination of the organic solvents or the room air by saturated aliphatic hydrocarbons may cause considerable interference, necessitating tests to show the possible presence of such contaminants. Sixteen normal alkanes ranging from $C_{10}H_{22}$ to $C_{36}H_{74}$ were analyzed by this method; relative standard deviations of 3 to 6% were obtained, and the similarity of the scans indicated reproducibility of the method. The apparatus required consists of various laboratory ware, two thin-layer chromatographic chambers thin-layer chromatographic plates coated with silica gel, self-filling micropipets, and a spectrophotofluorimeter. The reagents include methanol, rhodamine 6G, cyclohexane, chloroform, anhydrous ether, and n-docosane. The analytical procedure is discussed in detail, along with necessary calibrations, calculations, and the effects of storage.

32431 **APTIC NO. 54519**

Schehl, R., S. Ergun, and A. Headrick

SIZE SPECTROMETRY OF AEROSOLS USING LIGHT SCATTERING FROM THE CAVITY OF A GAS LASER. *Rev. Sci. Instr., 44(9):1193-1196, Sept. 1973, 13 refs.*

A gas laser cavity beam is used as a monochromatic radiation source for detecting and sizing aerosol particles. The aerosol is forced through the cavity of a 1/2 mW open cavity helium-neon laser having one plane mirror and one spherical mirror. Light scattered from individual particles is collected by a hemispherical mirror and is focused onto a detector. The system has good resolution and sensitivity, and it has the capability of measuring high aerosol concentrations without dilution. The spectrometer performs well as a laboratory instrument and could also be easily adapted for use as a portable dust monitor. (Author abstract modified)

32432 **APTIC NO. 54500**

Schehl, R. R.

A PORTABLE MONITOR FOR RESPIRABLE DUST UTILIZING A GAS LASER. *Scientific Instruments, 6(8):732-734, Aug. 1973, 7 refs.*

A portable dust monitor capable of measuring the concentration of respirable dust continuously for a period of 8 hr has been designed and constructed. The instrument uses the cavity beam of a He-Ne cw laser for the light source to detect individual particles by light scattering. Dust particles are forced through the cavity of a 1/2 mW open cavity He-Ne laser with one plane mirror and one spherical mirror. The scattered light pulses are detected by a photomultiplier tube and the resulting electrical pulses are discriminated by a single channel analyzer. A ratemeter counts the discriminated pulses and the concentration is displayed on a panel meter and recorded on a miniature strip-chart recorder. The instrument provides instantaneous meter readout and continuous reading; it is capable of detecting 0.109 micron polystyrene latex spheres, although 0.2 micron is probably a more reliable lower limit of sensitivity. (Author abstract modified)

32433 **APTIC NO. 54535**

Serege, Sandor

DUST CONCENTRATION MEASURING CYCLONE PROBE FOR THE MEASUREMENT OF CHEMICAL PLANT-GENERATED DUST EMISSIONS. *(Vegyipari uzemek porkibocsatasanak vizsgalatara alkalmas porkoncentraciomero ciklonszonda). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):209-212, 1973. 5 refs.*

A description is given of the S-20 TIP model cyclone probe for dust concentration measurements, developed by the Electrical Power Research Institute (VEIKI). The cyclone probe is equally suitable for routine measurements in operation control and for high-precision analyses. The apparatus works periodically, with the dust concentration determined immediately by a gravimetric method. Anisokinetic sampling from a partial flow is provided for, with suction rates ranging from 1 to 20 cu m/hr. The dust concentrations in closed gas streams are determined by the use of a dust collector at the lower end of the cyclone probe, while low, in-the-air concentrations of dusts are best determined by means of a membrane filter or sorption materials in the filter head. A filter head without a dust collector can be used for rapid routine control procedures.

32434 **APTIC NO. 54859**

Shoji, S., T. Kikuchi, and M. Sone

STUDIES ON THE SO_2 DETERMINATION IN WASTE FLUE GASES. *(Endo haieki chu SO2 no kensaho ni kansuru kento). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Pref. Pollut. Contr. Tech. Center Rep.), no. 1:11-15, May 1973.*

An improved method for determining sulfur dioxide in waste flue gases by estimating the sulfur content of raw materials and flue gas volumes was described. Heat-wire anemometers were used to measure gas velocity, and gas volumes were calculated using the equation which involves a rectification factor due to the remaining oxygen. Sulfur contents in heavy oil were detected by radioactive rays using the 241 Am gamma-ray absorption. No significant difference was found between the results of other conventional methods of measuring SO_2 and this improvement.

32435 **APTIC NO. 55198**

Smith, Franklin and A. Carl Nelson, Jr.

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM: REFERENCE METHOD FOR THE DETERMINATION OF SUSPENDED PARTICULATES IN THE ATMOSPHERE (HIGH VOLUME METHOD). (INTERIM REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-0598, EPA-R4-73-028b, Program Element 1H1327, 132p., June 1973, 10 refs.*

NTIS: PB 223051

Guidelines for the quality control of total suspended particulate measurements by the Federal reference method (high volume method) are presented. These include: good operating practices; direction on how to assess data and qualify data, directions on how to identify trouble and improve data quality, directions to permit the design of auditing activities; and procedures which can be used to select action options and relate them to costs. These guidelines are designed for use by operating personnel. The Federal reference method for the determination of suspended particulates in the atmosphere is appended. Calibration methods are mentioned. (Author abstract modified)

32436 **APTIC NO. 54348**

Soole, B. W. and K. Pannell

SOME MEASUREMENTS OF THE EFFICIENCY OF A ROTARY IMPACTION FILTER FOR THE REMOVAL OF SOLID PARTICLES FROM A FAST FLOWING AIR STREAM. *Ann. Occupational Hyg., 16(2):127-132, Aug. 1973, 9 refs.*

Preliminary experimental evidence is presented concerning the efficiency of a rotary impaction filter for the removal of dust from a fast-flowing stream of air. Measurements were obtained for particles of an equivalent diameter equal to 10 micron at an air flow-rate of 4.72 cu m/sec. The filter was 1.12 m in working diameter, and comprised 976 equally spaced 20 swg radial wires mounted from a central disk 0.668 m in diameter which required 1.98 kW for rotation at 500 rev/min.

The results demonstrated that provided the filter element was continuously washed by a small amount of suitable liquid to wet the dust an overall efficiency of 99.5% could be achieved, while at the smallest particle size for which the filter was designed to have zero penetration (10 micron) the efficiency was about the same as previously observed for droplets (98%). The study must be considered of limited scope since it was restricted to a single filter and a test dust that proved to have few particles near the theoretical size limit for complete removal.

32437 **APTIC NO. 54591**

Stoeber, Werner and Hermann Flachbart

AN EVALUATION OF NEBULIZED AMMONIUM FLUORESCEIN AS A LABORATORY AEROSOL. *Atmos. Environ., 7(7):737-748, July 1973. 16 refs.*

Aerosols from ammonium fluorescein solutions are evaluated, and their suitability as model aerosols in the micron and submicron size range are appraised by a spiral centrifuge. A suitable model aerosol should consist of spherical particles of uniform density at airborne concentrations which facilitate a convenient method of mass determination of an aerosol fraction sampled within a reasonable period of time. This study shows that, similar to procedures described for uranine, the original droplets emerging from the nebulizer dry up and form spherical particles of uniform density within a very short time after mixing with clean air of low humidity. In contrast to uranine aerosols, the ammonium fluorescein aerosols show no hygroscopicity. Their solubility in water is low, but by dissolving them in aqueous ammonia, a sensitive mass determination by fluorometric measurements under ultraviolet irradiation is feasible in the same way for uranine. The sensitivity evaluation was made with the spiral centrifuge aerosol size spectrometer under operating conditions for high size resolution. The particle density of the new aerosol substance was independent of the particle size and had an average value of 1.58 g/cu m. This value is probably too high due to a slight systematic calibration error of the centrifuge. Conventional density measurements gave a value of 1.35 g/cu m. The spiral centrifuge reconfirmed the excellent optimal size resolution achievable with this instrument. A value of better than 2.5% for sizes above 0.3 micron in aerodynamic diameter was found. For smaller sizes there is a worsening of the resolution to 11% at 0.08 micron which is qualitatively in keeping with theoretical expectations. The ammonium fluorescein is an excellent model aerosol for calibrating size-separating aerosol measuring devices. (Author abstract modified)

32438 **APTIC NO. 54908**

Sudo, Y., T. Kikuchi, and M. Sone

SEPARATION AND DETERMINATION OF LOW FATTY ACIDS IN WASTE GASES (1). *(Haigasu chu teikyu shibosan no bunri teiryo ho (1)). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Pref. Pollut. Contr. Tech. Center Rep.), no. 1:27-35, May 1973.*

Waste gases from whale rendering plants were analyzed. Low fatty acids in whale products were separated by distillation and vaporization and the components were determined by gas chromatography. Recovery ratios of low fatty acids from dilute concentration gases were examined by passing a prepared gas containing various concentrations of acetic acid or by passing butyric acid through cool desalinated water. When the component concentration of the gas was 3.5-3.7 ppm, 80-90% of it was recovered in the water. During the distillation process, 10 g of whale products, 300 ml water, and 10 N phosphoric acid were heated in a flask and the distillate condensed. During vaporization, volatile components were removed from 5 g of whale products by passing them through warm air and then cooling with ice. The components of these samples were determined by gas chromatography. Calibration curves show acetic acid, propionic acid, isobutyric acid, butyric acid, isovaleric acid, valeric acid, isocaproic acid, and caproic acid. Quantitative determination is capable of 0.1 mg accuracy.

32439 **APTIC NO. 54512**

Tucker, Armin W., Alan B. Petersen, and Milton Birnbaum

FLUORESCENCE DETERMINATION OF ATMOSPHERIC NO AND NO2. *Appl. Opt., 12(9):2036-2038, Sept. 1973. 7 refs.*

Atmospheric nitric oxide and nitrogen dioxide were determined by molecular fluorescence. The method consists of measurement of the ambient NO2 levels and of NO plus NO2 content by directing the air sample over an oxidizing column that converts the NO to NO2. The NO content was obtained by subtraction of the NO2 concentration from the NO plus NO2 concentrations. By flowing the air sample through a 25 cm long by 20 mm diameter glass column containing number eight mesh alumina saturated with a solution of 5 g of chromium trioxide dissolved in 5 ml of 50% sulfuric acid, the NO content was oxidized to NO2. The NO2 fluorescence was measured. At flow rates of 2-3 l/min through the column with a sample of approximately 1 pphm NO in N2, a conversion efficiency of almost 100% was observed.

32440 **APTIC NO. 54929**

Turk, Amos

EXPRESSIONS OF GASEOUS CONCENTRATION AND DILUTION RATIOS. *Atmos. Environ., 7(10):967-972, 1973. 4 refs.*

Expressions of gaseous concentration and dilution ratios were developed. Ratios of dilution or concentration of a gas sample are expressed as a pollutant quotient, or, if appropriate, an odorant quotient, Z, denoting the ratio of a pollutant (or odorant) concentration to some target amount. The expression pZ is defined as +log(10)Z, so that a positive value of pZ implies dilution and a negative value concentration. The effect of particulate matter on the Z function is considered. Various examples are given, including conversions from other common dilution expressions. (Author abstract modified)

32441 **APTIC NO. 54210**

Uchiki, Hideo

PRACTICE AND PROBLEMS IN MEASURING TECHNIQUES OF ODOR COMPOUNDS. *(Akushu seibun no sokutei gijutsu). Text in Japanese. Preprint, Kogai Kenkyu Taisaku Center, Tokyo, p. 77-90, 1973. (Presented at the Seminar on Practice and Application of Bad Odor Countermeasure Techniques, Tokyo, Japan, Aug. 1-2, 1973.)*

The perceptively determined odor intensity is related to the concentration of the odors by the relation intensity equals a constant times the log of concentration, it is also a function of the psychology of the inhabitants living in odorous areas. Odors are classified in five grades. Gas chromatography, colorimetry, and mass spectrometry can be used to quantitatively measure odors. When odor concentrations are low they can be concentrated by adsorption, chemical reactions, or cooling.

32442 **APTIC NO. 54930**

Walter, Helmut and Ruprecht Jaenicke

REMARKS ABOUT THE SMALLEST PARTICLE SIZE DETECTABLE IN CONDENSATION NUCLEI COUNTERS. *Atmos. Environ., 7(10):939-944, 1973. 13 refs.*

The smallest particle size detectable in condensation nuclei counters (CNC) is discussed. The knowledge of the smallest particle radius rL detectable in CNC is very important after recent measurements have shown deviations from the classical shape of the size distribution in natural aerosols. Despite the lack of calibration aerosols in the important size range, the lower limit rL can be determined with gas to particle conversion in connection with coagulation processes. From numerical calculation, the equation rL equals l/c, vinculum r min, c equals 1.45 + or 0.10 was derived from vinculum r min can be evaluated from direct particle counts and volume determination by means of an absolute particle filter. (Author abstract modified)

32443 **APTIC NO. 54422**

Weiss, B., K. Hosto, and E. A. Boettner

QUANTITATIVE DIFFERENTIAL THERMAL ANALYSIS OF SMALL DUST SAMPLES CONTAINING QUARTZ. *Am. Ind. Hyg. Assoc. J., 34(5):193-199, May 1973. 12 refs.*

Quantitative differential thermal analysis was used to analyze mine and foundry dust samples varying in size from 40 to 2 mg. As little as 1% quartz was determined in 2 mg samples by use of a specially modified microholder. Sandwiching techniques permitted the analysis of the same amount of quartz in 40 mg samples with a standard 300 mg power holder. The effects of particle size variation and control of this variable are discussed. Preliminary experimentation indicates that the micro method may be applicable to the quantitative analysis of some asbestos minerals. (Author abstract)

1972

32444 **APTIC NO. 54230**

Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs.

AIRCRAFT INSTRUMENTATION FOR ATMOSPHERIC RESEARCH. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Atomic Energy Commission Contract AT(45-1):1830, p. 91-99, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

Atmospheric research instrumentation installed in a Cessna 411 aircraft is described. Meteorological and aircraft parameters are measured via three different systems. The first is a Metrodata Systems, Inc., Model M8 which measures temperature, humidity, airspeed, altitude, bearings from two points, distance from one point, and compass heading. The temperature and humidity are obtained from sensors in a probe mounted on the nose of the aircraft, with the temperature sensor using a shielded, linear response thermister head and the humidity sensor using a carbon strip hygrister. The second system is a Cambridge Systems Model 137-C3 Aircraft Hygrometer for measuring dew point temperature. The sensor is mounted on the left side of the aircraft nose and contains a platinum thermometer. The third system, a Universal Indicated Turbulence System, Model 1120, measures the turbulence intensity of a specific frequency band which lies within the inertial subrange. Other instruments which will be installed in the near future are: a Cloud Condensation Nuclei Counter which is capable of measuring cloud condensation nuclei concentrations at adjustable supersaturations in the range 0.2 to 2%; an Ice Nuclei Counter which is a fast-response counter for detecting ice nuclei in the concentration range 0.1 to 10,000 nuclei per liter over any activation temperature from 0 to -30 C; and a Quadrupole Mass Spectrometer which measures the concentration of gases in the range of 1 to 300 amu, with a sensitivity of 0.1 ppm real-time. With appropriate molecule sieves, concentrations in the ppb range can be attained. All of the data retrieved as measured and recorded automatically on magnetic tape. A sampling probe is used to collect particulates.

32445 **APTIC NO. 54371**

Brenchley, David L.

USE OF WATCH JEWELS AS CRITICAL FLOW ORIFICES. *J. Air Pollution Control Assoc., 22(12):967, Dec. 1972. 4 refs.*

The use of watch jewels as critical flow orifices in air sampling equipment was investigated. A series of laboratory tests was conducted on needle and watch jewel orifices. The bubble meter consisted of a calibrated graduated cylinder. The flow rate was determined by forming a soap meniscus at the bottom of the graduated cylinder and then timing its travel to the top. The needle valve allowed a controlled leak in the system and thus provided a means of varying the downstream pressure. All tests were conducted at 70 F and an upstream pressure of 1 atm. The watch jewel is superior to the needle orifice, but the glass capillary is apparently somewhat superior to the watch jewel. The needle orifice requires about twice the pressure drop of the capillary and watch jewel to reach the critical flow condition.

32446 **APTIC NO. 54505**

Burton, C. L.

QUANTITATION OF STACK GAS FLOW. *J. Air Pollution Control Assoc., 22(8):631-635, Aug. 1972. 14 refs.*

The presently available standards for measurement of gas flow in stacks and industrial flues are reviewed. Various problems associated with probe traverse techniques using the pilot static tube, the Type S pilot tube, a directional type pilot tube, and hot wire anemometers include: not providing an evaluation of the boundary layer, using incorrect calculational procedures when reverse flow is encountered, the lack of a suitable correction for pulsing flow conditions, improper orientation of the probe with flow streamlines, and to a lesser extent, lack of recognition of the vorticity phenomenon. The velocity probe and traversing technique should be used to measure the velocity profiles of the station being evaluated. Flow straighteners or egg crates can be used to help minimize large degrees of turbulence or vortex flow. When traversing the flue, enough data should be taken near the walls of the flue to permit a good evaluation of the boundary layers. Errors in the pilot tube can be minimized if an electrical pressure transducer of small displacement volume is used to read the probe signal in lieu of a draft gauge. The signal output of the transducer should be recorded.

32447 **APTIC NO. 55174**

Carruth, Grant F. and Riki Kobayashi

DIRECT STEADY STATE CALIBRATION OF A FLAME IONIZATION DETECTOR. *Anal. Chem., 44(6):1047-1050, May 1972. 17 refs. (Presented at the American Inst. of Chemical Engineers, National Meeting, 71st, Dallas, Tex., Feb. 22, 1972.)*

Responses over wide concentration ranges of n-paraffin hydrocarbons (ethane through n-decane) in helium carrier gas were determined by a steady state flow method for calibration of a flame ionization detector. Calibration mixtures were prepared by metering known flow rates of the hydrocarbon into a helium carrier gas. Accurate metering was accomplished with an 8 cu cm positive displacement plunger pump rated at 5000 psi. Desired discharge rates were obtained by use of a specially designed positive gear transmission with 224 fixed speeds and an overall gear ratio of 4.5 million to 1, in an approximately geometric progression. Maximum/minimum flow rates were 0.36 cu cm/min and 8 times 10 to the minus 8 cu cm/min, respectively. The metered flow was injected into the carrier gas by pumping against a slight flow restriction provided by a variable orifice. The amount of hydrocarbon passing the detector per unit time was determined with a Barber-Colman Hydrogen Flame Ionization Detector (FID) with a 1 cm diameter platinum ring as an ion collector. The signal from the FID was measured with an electrometer capable of measuring from 10 to the minus 12 to 10 to the minus 6. Calibration data are given for each compound, and a table compares the relative molar responses observed for the present work with literature values. Agreement is satisfactory, and the observed detector responses appear self-consistent. The maximum uncertainty in molar flow rates was less than 0.1% when metering liquids and less than 0.18% when metering vapors. The uncertainty in the calibration technique is considerably less than the uncertainty in the current measuring systems presently available.

32448 **APTIC NO. 55015**

Flatau, Abraham

AUTOROTATING BODY GAS DETECTOR AND METHOD OF USING THE SAME. *(Dept. of the Army, Washington, D. C.) U. S. Pat. 3,645,694. 5p., Feb. 29, 1972. 4 refs. (Appl. Sept. 16, 1968, 9 claims).*

An autorotating body gas detector with increased rotational and aerodynamic performance and fitted with various absorbent materials capable of retaining various fluid components has been designed to enable subsequent testing for presence or absence of gaseous contaminants by known chemical and/or physical means. The structure of the device is based upon the utilization of an aerodynamic apparatus comprising two coaxial cylindrical members positioned adjacent each other. The general convex and concave surfaces of each member are cambered with the added requirement that the leading and trailing edges are rounded so that the leading edge radius is noticeably greater in radius than the trailing edge. The coaxial members are positioned so that their concave sides are confronting each other, thus forming an air space by means of which the flow field is assisted such that the effect of the rotating means on the fluid medium is equivalent to a pumping action. This action provides an increases in the fluid circulation into and around the rotating means. The rearward edge of each coaxial member is positioned between the forward and rearward edges of the confronting member, and end plates are attached at the ends of the coaxial members to increase the aerodynamic and rotational performance efficiency.

32449 **APTIC NO. 55038**

Gadomski, Raymond R., Anthony V. Gimbrone, and William J. Green

SAMPLING AND ANALYSIS OF STACK EFFLUENT FOR GRAPHIC ARTS PROCESSES. PART 1. SAMPLING METHODOLOGY AND DATA TREATMENT. *Graphic Arts Technical Foundation, Inc., Pittsburgh, Pa., Res. Prog. Rep. 93, 11p., Nov. 1972. 25 refs.*

Terminology and general methods involved in testing stack emissions from the graphic arts processes are presented. Gas flow rate usually is measured at more than one location in the equipment of the process being tested. The preferred method is direct measurement of gas velocity by use of a pitot tube with incline manometer. Measurement of gas temperature is generally accomplished by use of a thermocouple pyrometer. The absolute static pressure of the stack gases usually differs little from atmospheric pressure. The difference can be measured either with the static pressure tap side of the pitot tube or with a regular pressure tap connected to one leg of a manometer. It is usually anticipated that the proportion, by volume, of water vapor in the duct gas will be less than 15% or a dew point less than 126 F. The procedure used in recording visible emission based on the Ringlemann Smoke Chart is described. Field testing personnel can attempt evaluation of odors by use of a Scentometer and a determination of the odor intensity and quality at the point of discharge of the gases into the atmosphere. Examples of data sheets used in a stack sampling program are included which illustrate accepted practices of selection and location of sampling points for a velocity profile. (Author abstract modified)

32450 **APTIC NO. 55110**

Gadomski, Raymond R., Anthony V. Gimbrone, William J. Green, and Robert J. Reitz

SAMPLING AND ANALYSIS OF STACK EFFLUENT FOR GRAPHIC ARTS PROCESSES. PART 2: GATF SAMPLING AND ANALYTICAL TECHNIQUE. *Graphic Arts Technical Foundation, Pittsburgh, Pa., GATF Research Progress Rept., 8p., Nov. 1972. 31 refs.*

A complete sampling and analytical procedure for the graphic arts industry and approved by the Federal Environmental Protection Agency is described. The unit is a modified hydrocarbon grab sampler and consists of a stack probe, a dry ice trichlorethylene refrigerated trap and an evacuable cylinder with a valve between the trap and cylinder. The procedure for an analysis starts with immersion of the coiled section of the trap in dry ice trichlorethylene until the sample is fully condensed. Without withdrawing the trap from the refrigerant, the two caps are removed from the trap and it is spliced onto the helium flow pattern. The temperature of the trap is then increased stepwise, first by exchange of the dry ice for ordinary ice and then by raising the electrical power input. The rate of vaporization must not exceed a linear detection rate. For calibration of the detector, 10 microliters of n-heptane is placed in a trap and frozen with dry ice. It is injected into the gas chromograph in the same manner as a sample except that the trap temperature is not raised above -16 C. The delivery from the syringe is better than + or 2%. The 10 microliter injection of n-heptane is equivalent to 10.65 ml carbon dioxide. The integrated output from the hydrogen flame detector is about 35,000 kolo counts/ml equivalent CO2. Illustrative cost tables from both the GATF sampling equipment and analytical time and instrumentation are presented. The average sampler unit cost, including all component sampling equipment, analyses, and maintenance time is $136.00. The field sampling equipment is portable and rugged. Analysis time is relatively brief.

32451 **APTIC NO. 54994**

Harman, John N., III and Radhakrishna M. Neti

NITRIC OXIDE ANALYSIS. *(Beckman Instruments, Inc., Fullerton, Calif.) U. S. Pat. 3,652,227. 6p., March 28, 1972. 3 refs. (Appl. Dec. 15, 1969, 24 claims).*

An inexpensive and improved method for rapid and continuous monitoring of the nitric oxide or nitric oxide plus nitrogen dioxide content of an air stream has been developed which avoids some if not all of the deficiencies in conventional techniques. The nitric oxide in the gas stream is reacted with an excess amount of ozone to completely convert the nitric oxide into nitrogen dioxide, and the resulting gas containing nitrogen dioxide and residual ozone is passed through a scrubber which removes the ozone but does not affect the nitrogen dioxide content of the gas. The resulting gas is then analyzed for its nitrogen dioxide content which is a function of the nitric oxide content. The method is particularly applicable to the monitoring of air for air pollution control. (Author abstract modified)

32452 **APTIC NO. 55002**

Heller, Austin N., John C. Bryson, and N. C. Vasuki

SOME APPLICATIONS OF REMOTE SENSING IN ATMOSPHERIC MONITORING PROGRAMS. *NASA Spec. Publ. SP-294, 1972:59-71, 1972. 12 refs.*

Remote sensing in atmospheric monitoring programs is illustrated by an examination of the air quality program of the Department of Natural Resources and Environmental Control in New Castle County, Delaware. The air quality of New Castle County is determined by using a network of four primary stations and ten secondary stations. Each of the primary stations continuously measures the following air-quality indicators: wind direction, wind speed, sulfur dioxide, total oxidants, nitrogen oxides, total hydrocarbons, carbon monoxide, ozone, and particulate. The ten secondary stations measure sulfur dioxide and particulate matter on a continuous basis and sulfation rate and dustfall on an integrated basis. The signals from each of the sensors are electronically isolated, conditioned, and multiplexed; and each remote station is scanned every three minutes from a central data acquisition unit. The scanning cycle initiates a sequential transfer of data from the remote to the central station over leased, low grade telephone lines, and a mini-computer in the data acquisition center maintains 15 min, 1 hr, 6 hr, and 24 hr moving averages for each air-quality indicator at each of the four stations. The 15 min average is recorded on magnetic tape for storage and future processing. The total cost of the system is approximately $250,000, and the data generated by the primary and secondary network offers a good measure of the general air quality in northern New Castle County.

32453 **APTIC NO. 54725**

Klimisch, H.-J. and K. Meissner

GAS CHROMATOGRAPHIC DETERMINATION OF CARBON MONOXIDE IN CIGARETTE SMOKE. *(Gaschromatographische Bestimmung von Kohlenmonoxid in Cigarettenrauch). Text in German. Beitr. Tabakforsch., 6(5):216-219, 1972. 9 refs. (Translation available from TRANS-CHEM, Inc., P. O. Box 6219, Knoxville, Tenn. 37914 as C214167.)*

A gas chromatographic method suitable for the quantitative routine determination of carbon monoxide in tobacco smoke is described. The CO is separated from other gases on a moderately activated molecular sieve column and is quantitatively determined after hydrogenation on a nickel-contact at 290 C with a flame ionization detector. This method is characterized by high sensitivity and great stability of the separation column. A comparison of a constant flow smoking machine and smoking machine operated by pistons, in which a container filled with a saturated solution of sodium chloride or a polyvinyl chloride bag was employed for gas storing, led to comparable results. The addition of sodium nitrate at 8% reduced the CO value by 30%. Filters have no influence on the CO yield.

32454 **APTIC NO. 54579**

Low, George M., James E. Lovelock, and Peter G. Simmonds

ATMOSPHERIC SAMPLING DEVICES. *(Assignee not given.) U. S. Pat. 3,662,604. 8p., May 16, 1972. 2 refs. (Appl. Oct. 15, 1970, 10 claims).*

An atmospheric sampling device has been developed which includes a means for charging and discharging the sample to form a carrier gas dispersion suitable for analysis. The chamber which is positioned within a container has an inlet in communication with the atmosphere to be sampled and an outlet in communication with an analysis device such as a gas chromatograph. An annulus in the container adjacent the outer walls of the chamber contains a fluid medium for pressurizing the chamber to exhaust its contents through the outlet. One embodiment features the chamber as a gas-impervious bellows which is exhausted by feeding gas to the container; while in another embodiment, the chamber is formed of a hydrogen-permeable palladium alloy tube, and the fluid medium is an electrolyte capable of transporting an ionic species of hydrogen. The tube is electrolytically connected to a counter electrode in a first evacuation polarity mode and is exhausted for charging of the sample. The reverse polarity mode allows for the generation of hydrogen through the tube wall; the hydrogen acts as a purging gas and a carrier gas to discharge the sample and sweep it through the gas chromatograph column and detector. (Author abstract modified)

32455 **APTIC NO. 54593**

Lyshkow, Norman A.

METHOD AND APPARATUS FOR ANALYSIS OF NO AND NO2. *(Pollution Monitors, Inc., Chicago, Ill.) U. S. Pat. 3,667,918. 6p., June 6, 1972. 3 refs. (Appl. Feb. 17, 1971, 14 claims).*

A colorimetric method for determining the content of nitric oxide and nitrogen dioxide in gas streams has been developed which enables separate analyses of NO2 and NO in an efficient and uniform manner and which provides a more stable flow of the gas sample to insure accurate results. The gas is first contacted in a scrubber with an aqueous reagent solution containing a diazotization agent such as a primary aromatic amine and a coupling compound such as an aromatic amine or phenolic compound. The NO2 in the gas reacts with the reagent solution for the development of color, and the difference in color intensity before and after contact with NO2 is the measure of NO2 content. The gas is humidified to contain at least 50% relative humidity on contacting the first reagent solution. Unabsorbed gases are then treated with sulfanilic acid or sulfanilamide deposited on an inert carrier to remove residual amounts of NO2, and the resulting NO-containing gas is contacted with a solid oxidizing agent to oxidize NO to NO2. The gas containing NO2 is then contacted with a second scrubber solution containing a diazotizing agent to determine the content of NO in the gas sample by measurement with a photocell.

32456 **APTIC NO. 54998**

Olin, John G.

AEROSOL MASS CONCENTRATION SPECTROMETER. *(Thermo-Systems, Inc., St. Paul, Minn.) U. S. Pat. 3,653,253. 11p., April 4, 1972. 8 refs. (Appl. Jan. 5, 1970, 31 claims).*

An aerosol mass concentration spectrometer has been developed for determining in situ the particle mass concentration distribution in a relatively short period of time. The apparatus incorporates a sensing element such as a piezoelectric crystal which has a collection surface sensitive to changes in mass. The particles are force deposited on the sensing element, and the amount of force is sequentially changed to alter the critical particle size deposited on the sense element. The mass of the particles accumulated on the element during each force period is monitored to provide information usable to determine the particle mass concentration distribution. The difference between particle mass concentration at two successive values of critical particle sizes provides data relative to particle mass concentration distribution. (Author abstract modified)

32457 **APTIC NO. 54240**

Sehmel, G. A. and F. D. Lloyd

SOIL RESUSPENSION BY SURFACE CREEP. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 138-140, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

A sampler was tested for measuring resuspension of soil particles from soil erosion by surface creep. After particle collection, the sampler was removed and analyzed for the relative mass loading in each small square and for the particle size distribution in the squares along the upwind edge and at the middle of the sampler. The mass collected in each small square was normalized to the mass collected along the upwind edge. The collection decreased rapidly with downwind distance apparently because many particles actually rolled into the edge squares, with fewer being airborne for short jumps into the downwind squares. The mass median particle diameter along the upwind edge was 136 micron, while the mass median particle diameter at the center of the sampler was 108 micron. The sampler shows a size as well as mass sampling bias from the upwind edge; this bias, however, is considered to be negligible compared to the more difficult problem of closing a mass balance around resuspending radio-active particles. The surface sampler is capable of collecting particles at least from 20 to 25 micron.

32458 **APTIC NO. 54241**

Sehmel, G. A. and F. D. Lloyd

SOIL RESUSPENSION BY SALTATION. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II:*

Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 141-143, Dec. 1972. 3 refs.

NTIS: BNWL-1651 PT1, UC-53

Soil erosion by wind causes soil particle movement by suspension, saltation, and surface creep. Particles moving in saltation are initially lifted almost vertically before gravitation causes deposition. An omni-directional sampler for collecting particles moving by saltation constructed from metal funnels with a maximum diameter of 16 cm has been tested in the field for total mass collection and particle size distribution as a function of height. The mass medium particle diameters were determined to range from 140 to 200 micron and were a function of height. The exposure (particle collection per unit height) decreased rapidly with height, displaying a 1 to 1.5 order of magnitude decrease to a height of 30 cm. Although similar rapid decreases have been previously reported, these are the first data that show the effect of particle diameter on exposure. Assuming that the curves for these data can be extrapolated to smaller respirable particle diameters, the conclusion is that respirable particles also show a rapid decrease with height in the first 12 in. This rapid decrease would be unexpected since particle concentration of 20 to 60 micron in diameter decrease less than one order of magnitude from 1 to 400 ft.

32459 **APTIC NO. 54770**

Siegel, Richard S.

MEASUREMENT OF AIRCRAFT ENGINE POLLUTANT EMISSIONS. A REVIEW OF INSTRUMENTATION, TEST, AND SAMPLING PROCEDURES. *J. Air Pollution Control Assoc., 22(11):845-853, Nov. 1972. 59 refs.*

A review of instrumentation, test, and sampling procedures used in the measurement of aircraft engine pollutant emissions is presented. Measurement of emission rates from an aircraft engine involves three major requirements: a test procedure specifying engine operating conditions; a sampling technique for obtaining a representative sample of exhaust gas; and analysis instrumentation for determining pollutant concentrations in the exhaust gas sample. Apparatus used for sampling generally consists of a probe, sampling line, a flow measuring device, a pump capable of drawing the desired flow rate through the system, and collection devices for capturing pollutant samples. Two types of test procedures can be used in measuring emissions. In the first type, emission rates of all pollutants are measured at each steady state engine operating condition. These measured rates are then averaged, with appropriate weighting factors to determine the total emissions for a complete operating cycle. In the second type, the engine is actually operated through a complete and representative operational cycle and a composite sample is collected and analyzed. The weighted average emission rate for the operational cycle is obtained directly. Instruments which appear to be most suitable for measurement include nondispersive infrared for carbon monoxide and dioxide, heated flame ionization for total hydrocarbons, chemiluminescence for nitrogen oxides, nondispersive ultraviolet for nitric oxide, SAE smokemeter for smoke, a human odor panel for odor, and a 3-MBTH for aldehydes. Sulfur dioxide is determined from fuel analysis and there is no instrument for particulates.

32460 **APTIC NO. 55003**

Sussman, M. V.

CONTINUOUS CHROMATOGRAPHIC MONITORING OF GAS STREAMS. (FINAL REPORT). *Tufts Univ., Medford, Mass., Dept. of Chemical Engineering, Environmental Protection Agency Grant 5-R01 APO 0640-02, 84p., 1972 (?). 24 refs.*

A technique was devised for performing gas chromatography in a continuous rather than an intermittent fashion. The technique, Continuous Surface Chromatography (CSC), employs a rotating, packing-free chromatographic channel, formed between matching, closely-spaced solvent-coated surfaces of revolution. The CSC concept will permit construction of instruments which continuously and simultaneously monitor the concentrations of a variety of components in a gas stream and which respond to changes in these concentrations in a fraction of a second. Prototype instruments were able to separate streams of model mixtures of gases (butane, propylene, and methane) at flow rates exceeding 20 cu cm/min. The experimental procedures are described along with mathematical procedures that permit computer simulation of CSC behavior. A general procedure is outlined for establishing operating conditions that will produce component separation in a CSC instrument. (Author abstract modified)

1971

32461 **APTIC NO. 54697**

Coordinating Research Council, Inc., New York, NO and CO Measurement Sub-Panel

COOPERATIVE EVALUATION OF TECHNIQUES FOR MEASURING NO AND CO IN DIESEL EXHAUST. (FINAL REPORT). *Rept. CRC-APRAC CAPI-1-64-4, Rept. CRC 443, 59p., March 1971.*

NTIS: PB 206732

A cooperative experimental program was conducted to evaluate the measurement methods used to determine nitric oxide, nitrogen dioxide, nitrogen oxides, carbon monoxide, and carbon dioxide in diesel exhaust. The tests were conducted at one site on a multi-cylinder diesel engine. Exhaust analyses were conducted at steady-state engine conditions and on a 3-minute cycle test. Span gases of unknown concentration were also analyzed. The results of the engine tests varied, but averaged less than + or 5% standard deviation, both within (repeatability) and among (reproducibility) the instruments, except at the lowest level CO and NO concentrations. The short cycle test results were in good agreement with steady state measurements. A test designed to evaluate the effect of a desiccant on routine emission measurements indicated no significant difference among products. The instrumentation used in the study were satisfactory for conducting emission measurements on diesel exhaust. (Author abstract modified)

32462 **APTIC NO. 55119**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR CONCENTRATION OF ODOROUS VAPORS (ADSORPTION METHOD). *Book ASTM Stand., 1971:268-271, 1971.*

An activated carbon method for the determination of the concentrations of odorous vapors in complex mixtures in the atmosphere is given. A desorption apparatus is used, along with a thin bed of activated carbon. Approximately 1000 to 5000 l of air were collected, after which determinations were made of the moisture content of the sample and, if desired, the vapors removed from the surface of the carbon and recovered for quantitative analysis. There are two methods of desorption: displacement of the adsorbed organic vapors by a hot inert vapor such as steam; and heating the carbon in a vacuum and distilling the desorbed material into cold traps. If some of the vapors are known or suspected to be water soluble, the proportion of water in an aliquot sample of the aqueous layer can be determined by a chemical aquametric method. Formulae are given for the calculation of the concentration by weight of the odorous vapors in the atmosphere and for the calculation of the concentration of vapors in ppm by volume (used if the average molecular weight of the vapors is known or assumed). The concentration of the vapors is expressed in units of milligrams of vapor per 1000 liters of air, or in terms of ppm, by volume (if the average molecular weight of the vapors is known or assumed).

32463 **APTIC NO. 55120**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHODS FOR CONTINUOUS ANALYSIS AND AUTOMATIC RECORDING OF THE SULFUR DIOXIDE CONTENT OF THE ATMOSPHERE. *Book ASTM Stand., 1971:272-284, 1971. 11 refs.*

Conductivity and electrolysis methods for the continuous analysis and automatic recording of the sulfur dioxide content of the atmosphere are discussed. The conductivity method is intended for the determination of low concentrations of SO2 in the atmosphere; it is not specific for SO2 as other soluble electrolyte-forming gases such as halogen acids also affect the results. Sulfur dioxide concentrations between 0.01 ppm and 10.0 ppm can be determined. The SO2 in a sample of the atmosphere is absorbed in slightly acidified water containing hydrogen peroxide, and continuous recording of the electrical conductivity of the resulting sulfuric acid solution takes place. The efficiency of SO2 absorption is from 98 to 100% and the conductivity analysis agrees well with results obtained by iodometric or acidimetric titration. The electrolysis method is responsive not only to SO2, but to other oxidizable sulfur compounds such as hydrogen sulfide, mercaptans, and organic disulfides. Sulfur dioxide concentrations of 0.1 to 10 ppm can be measured. The method involves tha absorption of SO2 from a measured air stream in an acidified bromide solution. The precision and accuracy of the method are good. Detailed discussions of interferences, apparatus, reagents, procedures, and calibrations are given for each method.

32464 **APTIC NO. 55121**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD DEFINITIONS OF TERMS RELATING TO ATMOSPHERIC SAMPLING AND ANALYSIS. *Book ASTM Stand., 1971:285-290, 1971.*

Standard definitions are given for 134 terms relating to atmospheric sampling and analysis. General terms such as air pollution and atmosphere are included, along with equipment names and sampling, measurement, and evaluative methods.

32465 **APTIC NO. 55122**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD RECOMMENDED PRACTICE FOR PLANNING AND SAMPLING OF THE ATMOSPHERE. *Book ASTM Stand., 1971:291-297, 1971. 15 refs.*

The broad concepts of sampling the atmosphere for determination of its constituents are presented; they are applicable to the sampling of ambient air, air in enclosed systems, and air in enclosed spaces such as work areas. Statistical consideration must determine the adequacy of the samples, and probability replaces certainty in results. The meteorological factors of most importance in investigations of the components of the atmosphere are wind, atmospheric stability, relative humidity, and precipitation, and topography can also affect the composition of the atmosphere. The selection of a sampling procedure depends on variables such as the quantities of the materials encountered and on whether single or multiple sources of pollution exist. In the choice of sampling equipment, consideration must be given to the type of contaminant to be determined and its probable range of concentration, and automatic instruments employing physical methods of analysis which provide a permanent record are generally most desirable. Reagent grade chemicals and reagent water should be used in all tests. The procedure for sampling should involve the following steps: a general exploratory survey of the area and the sources of the atmospheric components; a preliminary meteorological survey; and exploratory sampling to determine the types of components in the atmosphere, their possible relationships, and the need for most extensive sampling.

32466 **APTIC NO. 55123**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD FOR MEASUREMENT OF ODOR IN ATMOSPHERES (DILUTION METHOD). *Book ASTM Stand., 1971:301-304, 1971.*

A quick and practical method for measuring odor concentrations in the atmosphere and gases discharged for industrial process operations, and for determining the odor emission rate from a stack or vent is presented. A sample of the atmosphere or gas is diluted with odor-free air until a dilution is achieved in which the odor can barely be perceived. The ratio of the total volume of the diluted sample to the volume of the original sample is a measure of the concentration of odor in the original sample. The character of the odor is not taken into account. Definitions of odor unit, odor concentration, and odor emission rate are provided. Extraneous odors, lingering taste effects, poor physical condition of the observer, and lack of suitability on the part of the observer interfere with this test. The testing apparatus consists of a sampling syringe, dilution syringe, transfer syringe, transfer needle, syringe caps, and an odor-free room. A single observer should be able to attain results that are reproducible around 50% on any given day; where greater accuracy is desired, more observers should be used and their results averaged. Equations for calculating the odor concentration and odor emission rate are given.

32467 **APTIC NO. 55124**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD RECOMMENDED PRACTICES FOR SAMPLING ATMOSPHERES FOR ANALYSIS OF GASES AND VAPORS. *Book ASTM Stand., 1971:349-370, 1971. 8 refs.*

Two practices for the sampling of atmospheres for analysis of gases and vapors are presented. General rules applicable to both practices are given regarding basic requirements and the interval between collection and analysis. The first method relates to sampling atmospheres without concentration of the gases and vapors. The apparatus consists of an evacuated container and gas sample tubes or heavy-wall glass bottles. Sampling may be accomplished by gas or water displacement, or with the aid of collapsed bags or vacuum-type sample containers. The second practice relates to sampling atmospheres with concentration of the gases and vapors. Apparatus consists of gas pumps, a gas metering device, a pressure gage or manometer, absorbers, and sampling lines and probes. In collecting concentrated samples of gases and vapors, their separation from particulate matter must be considered. Determination of the performance of the entire sampling assembly is discussed, along with considerations relating to the collection of samples by absorption, adsorption, and condensation.

32468 **APTIC NO. 55125**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR INORGANIC FLUORIDE IN THE ATMOSPHERE. *Book ASTM Stand., 1971:371-380, 1971. 8 refs.*

A method for analyzing various types of atmospheric samples for total fluoride ion in the range from 0.005 to 10 mg is presented. It is intended primarily for inorganic fluorides and is not applicable to certain organic fluoride compounds. Too much acid in the distillate, residual amounts of fluoride in the distillation flasks, sulfuric acid, large amounts of aluminum or silicon, borates, phosphates, sulfates, nitrates, peroxides, sulfides, and sulfites interfere with the procedure and/or results. Reagents are calcium oxide, chloroacetate buffer solution, hydrochloric acid, hydrogen peroxide, perchloric acid, phenolphthalein solution, silver perchlorate solution, sodium alizarin monosulfonate solution, sodium fluoride, sodium hydroxide, sodium hydroxide solution, thorium nitrate, and thorium nitrate solution. Sampling procedures are given for gaseous inorganic fluorides, inorganic fluoride particles in the absence of gaseous fluorides, mists containing inorganic fluorides, and mixtures of gaseous and particulate inorganic fluorides. Preparation of the sample for distillation is discussed, along with distillation of the fluoride, titration of the fluoride, and calculation of the fluoride ion content of the total distillate.

32469 **APTIC NO. 55126**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR NITROGEN DIOXIDE CONTENT OF THE ATMOSPHERE (GRIESS-SALTZMAN REACTION). *Book ASTM Stand., 1971:381-386, 1971. 11 refs.*

A highly sensitive method for the manual determination of nitrogen dioxide in the atmosphere is presented. Concentrations between 0.005 and 5 ppm can be determined when the sampling is conducted in fritted bubblers, and concentrations between 5 and 100 ppm can be determined in industrial atmospheres and gas burner stacks using evacuated bottles or glass syringes. The NO2 is absorbed in an azo dye forming reagent. A stable pink color is produced within 15 minutes which may be read visually or in an appropriate instrument at 550 nm. Some interference may be provided by large concentrations of sulfur dioxide, ozone, peroxyacylnitrate, strong oxidizing or reducing agents, or other nitrogen oxides. When such interferences are present, the colors should be determined within 1 to 5 hours. Apparatus consists of an absorber, air-metering device, sampling probe, grab-sample bottles, glass syringes, air pump, and spectrophotometer or colorimeter. Reagents include an absorbing reagent, N-(1-naphthyl)-ethylenediamine dihydrochloride, nitrite-free water, and sodium nitrite. Sampling methods include the bubbler method, evacuated bottle method, and glass syringe method. Procedures are given for calibration and standardization, measurement of color, and calculations. A precision of 1% of the mean is achievable with careful work.

32470 **APTIC NO. 55127**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR OXIDES OF NITROGEN IN GASEOUS COMBUSTION PRODUCTS (PHENOL-DISULFONIC ACID PROCEDURE). *Book ASTM Stand., 1971:387-390, 1971.*

The phenoldisulfonic acid colorimetric procedure for the determination of total oxides of nitrogen (excepting nitrous oxide) in the gaseous effluents from combustion and other nitrogen oxidation processes is presented. It is applicable to NOx concentrations between 5 and several thousand ppm. The gas sample is admitted into an evacuated flask containing an oxidizing absorbent consisting of hydrogen peroxide in dilute sulfuric acid. The NOx are converted to nitric acid and the resulting nitrate ion is reacted with phenoldisulfonic acid to produce a yellow compound which is measured colorimetrically. Calibration curves prepared from samples of known nitrate content are used to determine the amount of nitrate in the sample. Inorganic nitrate, nitrites, and organic nitrogen compounds that are easily oxidized to nitrates, certain reducing agents, and halides interfere with the results. The apparatus, reagents sampling method, calibration curve preparation, procedure, and calculations are summarized.

32471 **APTIC NO. 55128**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR PARTICULATE MATTER IN THE ATMOSPHERE (OPTICAL DENSITY OF FILTERED DEPOSIT). *Book ASTM Stand., 1971:418-424, 1971. 13 refs.*

A method for measuring the extent of soiling or darkening of clean filter paper or other white fibrous media by filtration of particulate matter in the atmosphere is presented. Measurement is based on the light transmission or reflectance properties of the deposited solid or liquid particles that originally were dispersed in a gaseous medium. The maximum amount of deposited matter evaluated accurately by this method is that which corresponds to 50% attenuation of incident light or a maximum optical density of about 0.30. The accuracy and precision of the method depend upon the accuracy of calibration of the gas flow meter, the extent of variation of aspiration rate through the paper during each sampling cycle, and the filtration efficiency of the paper. The apparatus and reagents are given, and the procedure for spot samples, procedure for determination of mass concentrations, calculation procedures, limitations, and reporting procedures are discussed.

32472 **APTIC NO. 55130**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR MASS CONCENTRATION OF PARTICULATE MATTER IN THE ATMOSPHERE (CONTINUOUS-MEASUREMENT LIGHT-SCATTERING METHOD). *Book ASTM Stand., 1971:473-479, 1971. 15 refs.*

A procedure for the continuous recording of the mass atmospheric concentration of particulate matter between 0.05 and 40 micron in diameter is presented. Measurement is based on the light scattering property of microscopic solid or liquid particles dispersed in a gaseous medium. Particulate concentrations between 1 and 100,000 micrograms per cu m of air can be measured. The atmosphere is screened to remove particles larger than 40 micron, after which it is passed through a dark-field illuminated smoke chamber and weighed filter to collect the particulate matter. Small-angle, forward-scattered light from the aerosol strikes and photomultiplier tube, and the current generated is amplified, metered, and recorded. The collected particulates are weighed to obtain the average mass concentration corresponding to the average recorded roading. The calibration curve of the instrument is then used to obtain the variations in mass concentration of the matter during the sampling period. The readings of different instruments are compared by standardization with refrigerant-12 gas or a standard aerosol. The results obtained by any two instruments on a standard aerosol shoul/ not differ by more than 10%. The apparatus and reagents used are described, and the sampling procedure, calibration, standardization, procedure, calibration, and reporting procedure are discussed.

32473 **APTIC NO. 55132**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD RECOMMENDED PRACTICE FOR COLLECTION BY FILTRATION AND DETERMINATION OF MASS, NUMBER, AND OPTICAL SIZING OF ATMOSPHERIC PARTICULATES. *Book ASTM Stand., 1971:506-513, 1971. 11 refs.*

A procedure for the sample collection of particulate matter from the atmosphere by filtration and for the measurement of the mass amount, particle size, and particle size distribution of the collected material is presented. The method is applicable to solid particles and to liquid particles if the droplet size need not be determined. The apparatus used is described and necessary precautions, sampling procedures, and analytical procedures are discussed.

32474 **APTIC NO. 55133**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD FOR EVALUATION OF TOTAL SULFATION IN ATMOSPHERE BY THE LEAD PEROXIDE CANDLE. *Book ASTM Stand., 1971:514-517, 1971. 8 refs.*

A method for determining the amount of sulfur dioxide attacking a specific area during a specific period of time where this gas is known to be the only sulfur compound present is presented. The standard deviation from the mean of data using this method is 7%. The reagents and materials used are described, and the sampling procedure, analytical procedure, and reporting procedure are discussed. The preparation of the lead peroxide candle is also discussed.

32475 **APTIC NO. 55134**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR CONTINUOUS ANALYSIS AND AUTOMATIC RECORDING OF THE OXIDANT CONTENT OF THE ATMOSPHERE. *Book ASTM Stand., 1971:518-522, 1971. 4 refs.*

A method for the determination of low concentrations of oxidants (substances capable of liberating iodine from buffered, neutral potassium iodide solutions) in the atmosphere is presented. It is quantitative for ozone and registers nitrogen dioxide and certain peroxidized compounds with low sensitivity. A range of 0 to 20 to 100 pphm of ozone can be registered using the basic instrument settings. Reducing substances such as sulfur dioxide and hydrogen sulfide interfere with the determination. Air samples containing oxidants are scrubbed countercurrently in a wetted wall absorber by a 2% solution of buffered, neutral potassium iodide in water. The yellow color of the resulting solution is measured photometrically and recorded continuously on a strip chart recorded. As long as a constant air to liquid ratio is maintained, the instrument can be calibrated to read directly the concentration of a reference oxidant, such as ozone. Known mixtures of ozone and air or known concentrations of iodine in potassium iodide solution may be employed for this calibration. The absorbing solution is regenerated by passing it through a bed of activated carbon immediately before use. Different instruments will agree to about 5% of the average concentration at midscale. The apparatus, a continuous gas-liquid contacting device and a recording colorimeter, and absorbent are described. The dynamic calibration of the instrument and analytical procedure are discussed.

32476 **APTIC NO. 55135**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR CONTINUOUS MEASUREMENT OF NITRIC OXIDE, NITROGEN DIOXIDE, AND OZONE IN THE ATMOSPHERE. *Book ASTM Stand., 1971:523-530, 1971. 7 refs.*

A procedure for the continuous measurement of nitric oxide, nitrogen dioxide, and ozone in the atmosphere is presented. Nitrogen dioxide is absorbed by passing the air sample and a modified Griess reagent through a special absorber. This produces a red dye which is measured continuously in a recording colorimeter by comparison with the unreacted reagent in a similar reference cell. The range of response is 1 to 100 pphm. Nitric oxide is oxidized to NO2 by bubbling through dilute acid permanganate solution and determined in a separate absorber and colorimeter cell. There is a loss of about 5% of nitrogen oxides in the permanganate solution. For the O3 determination, a supply of NO in pure nitrogen is prepared in a low-pressure steel cylinder. Traces of NO2 are removed by passing the gas through a long column of soda-lime or ascarite before it is delivered to the air sample. Volatile nitrites and sulfur dioxide in high concentrations may interfere with the determinations. The method offers a reproducibility within 5% and an overall accuracy of 10%. The apparatus and reagents are described, and the calibration procedure and testing procedure are discussed.

32477 **APTIC NO. 55136**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

TENTATIVE METHOD OF TEST FOR LEAD IN THE ATMOSPHERE. *Book ASTM Stand., 1971:698, 1971.*

Separate measurements of particulate lead and nonparticulate Pb can be made. Nonparticulate Pb is that which will pass through a 0.45 micron filter and includes organic Pb. This procedure is designed to measure ambient Pb concentrations above 0.2 micrograms of Pb/cu m. The method employs a special short-term sampling procedure using an iodine absorber for the nonparticulate Pb and a membrane filter to collect the particulate Pb. It is satisfactory for measuring Pb with an accuracy of about 0.2 micrograms of Pb/cu m. It was discontinued in 1971 without replacement.

32478 **APTIC NO. 55137**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR POLYNUCLEAR AROMATIC HYDROCARBONS IN AIR PARTICULATE MATTER. *Book ASTM Stand., 1971:699-710, 1971. 12 refs.*

A method for the determination of microgram quantities of polynuclear aromatic hydrocarbons in air particulate matter is presented. The determination is made by air sampling, Soxhlet extraction, column chromatography, and ultraviolet spectrophotometry. The polynuclear aromatic hydrocarbons which can be effectively separated and analyzed by this technique are anthracene, phenanthrene, fluoranthene, pyrene, benz(a)anthracene, chrysene, benzo(a)pyrene, benzo(e)pyrene, perylene, benzo(g,h,i)perylene, anthanthrene and coronene. If the entire method is taken into account, the results of samples taken in the same vicinity at the same time will show a precision of 15 to 20%. If duplicate analyses are performed on the same organic fraction, a precision of approximately 10% is obtainable. The apparatus and reagents used are described, and the sampling procedure, calibration procedure, testing procedure, methods of calculation, and possible interferences are discussed.

32479 **APTIC NO. 55138**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

TENTATIVE METHOD OF TEST FOR C1 THROUGH C5 HYDROCARBONS IN THE ATMOSPHERE BY GAS CHROMATOGRAPHY. *Book ASTM Stand., 1971:783-789, 1971. 4 refs.*

A rapid method for the routine sampling and measurement of concentrations of individual C1 through C5 hydrocarbons in the atmosphere is presented. Thy lower limit of measurement is 0.01 ppm by volume and elution of 17 hydrocarbons can be accomplished within 16 minutes. The lower limit of measurement of the C3 through C5 hydrocarbons can be extended to 0.1 ppb by concentrating 100 ml of gas sample in a freeze trap. Directions are given for the collection of grab samples and integrated samples. The analysis is performed via gas chromatography using a single packed column operated isothermally at 0 C. The following hydrocarbons can be measured without condensation: methane, ethane, ethylene, acetylene, propane, propene, n-butane, isobutane, 1-butene, 2,2-dimethylpropane, 2-methylpropene, trans-2-butene, cis-2-butene, isopentane, n-pentane, 3-methyl-1- butene, and 1,3-butadiene. Hydrocarbons of higher molecular weight than C5 can be measured by concentration of the air sample. The retention time and peak response of replicate analyses of an air sample by this method should not deviate by more than 10% relative standard deviation. The apparatus and reagents used are described, and the sampling, calibration and testing procedures are given. Methods of calculation and potential interferences are discussed.

32480 **APTIC NO. 55139**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD OF TEST FOR CONTENT OF OXIDIZING SUBSTANCES IN THE ATMOSPHERE. *Book ASTM Stand., 1971:815-818, 1971. 5 refs.*

A method for the manual determination of low concentrations (between 0.01 and 10 ppm) of ozone and other oxidants such as nitrogen dioxide, chlorine, peroxyacyl nitrate, and hydrogen peroxide in the atmosphere is presented. Micro amounts of ozone and other oxidants are collected by absorption in a solution of potassium iodide buffered to a pH of 6.8. Thy released iodine equivalent of the concentration of oxidant present in the air is determined spectrophotometrically by measuring the absorption of triiodide ion at 352 nm. Among the substances which can interfere with the results are nitrogen dioxide, peroxyacyl nitrate, and sulfur dioxide. In that the nature and composition of the total oxidant depends on the atmosphere being sampled, it is not possible to establish the absolute accuracy of this method. The apparatus and reagents used are described, and the sampling procedure, preparation of the calibration curve, test procedure, and method of calculation are discussed.

32481 **APTIC NO. 55140**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

TENTATIVE METHOD OF TEST FOR MERCAPTAN CONTENT OF THE ATMOSPHERE. *Book ASTM Stand., 1971:819-822, 1971. 7 refs.*

A method for measuring the concentration of mercaptans in the atmosphere at concentrations below 100 ppb is presented. For concentrations above 100 ppb, the sampling period can be reduced or the liquid volume increased either before or after aspirating. This method determines total mercaptans and does not differentiate among individual mercaptans, although it is most sensitive to the lower molecular weight alkanethiols. It is intended for obtaining an integrated sample over a selected time span either manually or in an automatic sequential sampler using 10 ml of absorption liquid in a bubbler. The absorption liquid is delivered to the laboratory for colorimetric analysis by reaction between the collected mercaptan and N,N-dimethyl- p-phenylenediamine. The absolute collection efficiency and accuracy of this method is presently unknown. The apparatus and reagents used are described, and the calibration procedure, testing procedure, method of calculation, and possible interferences are discussed.

32482 **APTIC NO. 55141**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

TENTATIVE METHOD OF TEST FOR SULFUR DIOXIDE CONTENT OF THE ATMOSPHERE (WEST-GAEKE METHOD). *Book ASTM Stand., 1971:823-831, 1971. 12 refs.*

A selective, sensitive, and reproducible method for the colorimetric determination of concentrations of 0.003 to 5.0 ppm sulfur dioxide in the atmosphere is presented. Sulfur dioxide is absorbed via aspiration of a measured air sample through a solution of potassium or sodium tetrachloromercurate, resulting in the formation of a dichlorosulfitomercurate complex. This compound is treated with solutions of formaldehyde and specially purified acid-bleached pararosaniline containing phosphoric acid to control pH. The pararosaniline, formaldehyde, and bisulfite anion react to form the intensity colored pararosaniline methyl sulfonic acid which behaves as a two-color pH indicator. The pH of the final solution is adjusted to 1.6 + or 0.1 by the addition of prescribed amounts of 3 M phosphoric acid to the pararosaniline reagent. In another variation of this method, a larger quantity of phosphoric acid is added to yield a pH in the final solution of 1.2 + or 0.1; the former method is the method of choice. The precision at the 95% confidence level is 4.6%, while the accuracy has not yet been determined. The apparatus and reagents used are described, and the sampling, testing, and calibration procedure are described. Standards, method of calculation, and potential interferences are also discussed.

32483 **APTIC NO. 55142**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD FOR SAMPLING STACKS FOR PARTICULATE MATTER. *Book ASTM Stand., 1971:832-858, 1971. 8 refs.*

A method for sampling particulate matter in a moving gas stream in confined spaces for qualitative and quantitative consideration is presented. Planning a stack test requires knowledge of the process that produces the dust-laden gas stream and selection of the sampling site. Before particulate sampling can be performed, the following parameters of the flue gas flow must be measured: velocity, static pressure, temperature, moisture, and gas density. The sampling train for collecting particulate samples from a gas stream flowing through a stack or flue consists of a sampling nozzle of the proper dimensions and design; a particulate collector, most commonly a filter; a probe for extending the filter holder and nozzle into the flue; a condenser to remove excess moisture; a metering device for measuring the volume of gas sampled; a pump or aspirator with a valve for control of gas flow; and thermometers and pressure gauges to measure sample gas conditions at appropriate points in the sampling train. Terms relating to atmospheric sampling and analysis are defined, and the sampling and testing procedure are discussed. Methods of calculation of the dust concentration, emission rate, and collection efficiency are also discussed.

32484 **APTIC NO. 55143**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD METHOD FOR EVALUATION OF AIR ASSAY MEDIA BY THE MONODISPERSE DOP (DIOCTYL PHTHALATE) SMOKE TEST. *Book ASTM Stand., 1971:862-867, 1971. 3 refs.*

The dioctyl phthalate (DOP) smoke test is a highly sensitive and reliable technique for measuring the fine particle arresting efficiency of an air or gas cleaning system or device. It is especially useful for evaluating the efficiency of depth filters, membrane filters, and other particle-collecting devices used in air assay work. A monodispersed aerosol of 0.3 micron in diameter is continuously generated by condensation of dioctyl phthalate vapor under controlled conditions. A metered portion of this aerosol is drawn through a specimen mount containing the item under test. Flow rate through the specimen is adjustable and the corresponding flow resistance is noted as part of the test. With the aerosol generation stabilized, the aerosol concentration is measured upstream and downstream of the specimen under test by use of a linear forward light-scattering photometer. The results are expressed as percent of DOP penetration at the flow rate used. The equipment used and its maintenance are discussed, along with the test procedure and means of ensuring a reliable level of precision and accuracy.

32485 **APTIC NO. 54442**

Bhatia, Kishan

GAS CHROMATOGRAPHIC DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS. *Anal. Chem., 43(4):609-610, April 1971. 12 refs.*

An analysis of high-boiling polycyclic aromatic mixtures was performed using columns packed with OV-7 (20% phenylmethylsilicone)-coated glass beads which were pretreated with dimethylchlorosilane. All chromatographic data were collected on a Beckman gas chromatograph, Model GC-4; and columns were run for 4 min at 170 C, followed by a temperature rise of 6 C/min to 260 C until the end of the analysis. Complete separation of benzopyrenes from benzo(k)fluorathene and perylene was realized on two columns in tandem (each 1/8 in. diameter, 10 ft long) of OV-7 on 100/120 mesh glass beads. Base line separation of the two peaks due to the benzopyrenes was not realized, but the better than 70% resolution obtained was considerably better than that previously reported and comparable that reported for capillary columns. The separation was adequate to allow determination of each benzopyrene in synthetic mixtures containing as many as 30 components comprising tri-, tetra-, penta-, and hexacyclic aromatic compounds and n-alkanes with carbon numbers of 20, 22, 24, 28, 32, and 36. Calculated observed weight percentages for benzo(a)pyrene in two synthetic mixtures were 3.77 and 3.93 wt%, whereas the actual values were 3.6 and 3.8 wt%, respectively. Observed concentrations of most polycyclic aromatic hydrocarbons in synthetic mixtures deviated from actual wt% by 3 to 15% of the amount present. The present method can be adapted to the analysis of airborne particulates and distillates containing polycyclic aromatic hydrocarbons.

32486 **APTIC NO. 54660**

Carnes, Richard C.

SPECTROSCOPIC INSTRUMENTATION FOR REMOTE POLLUTION MONITORING. *Preprint, American Society for Metals and Society of Manufacturing Engineers, 21p., 1971. 1 ref. (Presented at Western Metal and Tool Conference and Exposition, Los Angeles, Calif., March 8-11, 1971, Paper W71-19,1.)*

Three levels of remote sensing instrument systems developed by the Bendix Corporation are described. The first is the Bendix Thermal Mapper, the world s first commercial infrared line scanner. It responds to the relatively long wavelength emittance, or thermal band, infrared energy emitted by any substance in nature. It can be used to produce a synoptic view of a thermal plume or to aid in the police surveillance of oil dumping. The second detection system, the Bendix Air Pollution Detection Instrument, is a ground based, nonimaging spectrometer which measures the distribution of infrared energy in a given path through the air, according to various wavelengths or optical bands. It can be used to detect the following man-made pollutants, all of which have detectable infrared spectra: carbon monoxide, ozone, sulfur dioxide, nitrous oxide, nitrogen dioxide, peroxyacetyl nitrate, and various hydrocarbons. The third type of pollution detection system combines the line scanner and spectrometer instruments in the multispectral line scanner. This system images in many spectral regions throughout the atmospheric windows and thus combines spectral signature data not only from reflected sun energy but also, coherently, from emitted earth energy. No experiments have been conducted against pollution targets per se, but it has obvious potential with, for example, chemical pollutants in water.

32487 **APTIC NO. 55118**

Cohen, Ariel

THE SIZE SPECTRUM DETERMINATION OF SPHERICAL PARTICLES BY LIGHT SCATTERING, PART I: METHOD. *In: Application of Laser Techniques to Investigation of Clouds and Particles in the Atmosphere (Final Report). Hebrew Univ. of Jerusalem, Jerusalem, Israel, Dept. of Meteorology, Environmental Science Services Administration Contract ESSA E-100-67(E), Contribution 44-17, p. 21-33, Sept. 1971. 7 refs.*

NTIS: COM-72 11427

A method for the size spectrum determination of spherical particles by light scattering is presented. The appearance of maxima and minima values in the Mie scattering intensity, I (alpha), as function of the size parameter (alpha equals 2 pi r/lambda), can be used for the definition of the size spectrum of spherical particles, if the scattering intensity I (lambda), of these particles, is recorded as function of wavelength (lambda). To the particles having a radius r sub c and refractive index n, two series of lambda values can be fitted, (lambda i sub o and lambda prime i sub o), so that lambda i sub o is equal to 2 pi r sub o divided by alpha max, i; lambda prime sub i o is equal to 2 pi r sub o divided by lambda min, i. Alpha sub MAX; i(alpha sub MIN;i) is the value of alpha corresponding to the i to the th power maximum (minimum) point of I (alpha). If it is defined: A (r j) is equal to the summation operator with n above and i equal 2 below (I(lambda i sub j) I (lambda i sub j), the function A (r j) describes the size spectrum with a degree of accuracy which increases with N. The N-value, representing the available number of maxima and minima, respectively, can be increased to a practically desired value by recording I(lambda) at various scattering angles. This method of defining the size spectrum does not require any assumption on the size spectrum function. (Author abstract modified)

32488 **APTIC NO. 55059**

Corcoran, Fred L., Jr. and William G. Elliott

DIRECT DETERMINATION OF CHLORINE WITH THE 10,000 K ARGON PLASMA JET. *Preprint, Spectrametrics, Inc., Burlington, Mass., 13p., 1971. 5 refs. (Portions presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 23rd, Cleveland, Ohio, March 6-10, 1971, Paper 99.)*

A method has been developed for the direct atomic emission of chlorine in inorganic and organic chlorine compounds. A DC arc argon plasma jet is utilized as the excitation source. The operating requirements are good and the plasma relatively stable, and there is a relatively rapid sample throughput with good linearity in the range studied. The accuracy and ease of analysis by spectrometry appears sufficient to allow routine determinations, there is a minimum of sample pretreatment, and the method appears to be applicable to both organic and inorganic samples. (Author summary modified)

32489 **APTIC NO. 54270**

Dams, Richard, Kenneth A. Rahn, Gordon D. Nifong, John A. Robbins, and John W. Winchester

NONDESTRUCTIVE MULTI-ELEMENT NEUTRON ACTIVATION ANALYSIS OF AIR POLLUTION PARTICULATES. *American Nuclear Society, Proc. Am. Nucl. Soc. Top. Meet. Nucl. Meth. Environ. Res., Columbia, Mo., 1971, p. 8-15. 5 refs. (Aug. 23-24.)*

A nondestructive and computer assisted neutron activation analytical procedure was developed for the determination of up to 33 elements in air pollution particulates. The procedure was tested in pilot studies of samples taken in and near the urban industrial area of northwest Indiana and Chicago. Following a 5-minute neutron irradiation, the sample is counted after 3- and 5-minute decay periods giving gamma-ray spectra suitable for the determination of calcium, titanium, vanadium, copper, aluminum, sulfur, sodium, magnesium, manganese, indium, chlorine, bromine, and iodine. Following a 2 to 5-hour neutron irradiation, the sample is counted after either 20 to 30-hour or 20 to 30-day decay periods suitable for the determination of potassium, lanthanum, samarium, europium, copper, zinc, wolfram, gold, gallium, arsenic, antimony, bromine, scandium, cerium, thorium, chromium, iron, cobalt, nickel, silver, mercury, and selenium. In one test, a 36-hour time series of 90-minute samples indicated that both meteorological and time-dependent source processes may influence concentrations of the elements determined. Analyses of 25 samples, which were collected by filters simultaneously over a network including both urban and rural locations, indicated that some elements have principal sources lying within the urban-industrial region. In the same region size fractions of particles were collected by cascade impactors fitted with polyethylene impaction surfaces. Systematic differences were observed over the radius range 0.1 to 10.0 micron where refractory metals, such as iron, aluminum, and the rare earths, were found on distinctly larger particles than elements such as zinc, indium, arsenic, and antimony where vapor condensation in some high-temperature industrial sources is expected. (Author abstract)

32490 **APTIC NO. 55075**

Elliott, William G.

A HIGH TEMPERATURE ARGON PLASMA FOR SPECTROCHEMICAL ANALYSIS OF SOLID, LIQUID, OR GASEOUS SAMPLES. *Am. Lab., 1971:1-9, Aug. 1971. 13 refs.*

The development of a high temperature argon plasma for spectrochemical analysis of solid, liquid, or gaseous samples is described. The SpectraJet combines the advantages of argon plasma with the convenience and ease of operation of conventional combustion flames, without the disadvantages of either. It is quiet, safe, and stable; uses standard 120-v ac power; and can be operated by a laboratory technician with training comparable to that required for operation of a flame photometer. The high temperature of the argon plasma dissociates compounds that are normally considered refractory, and sufficient energy is available to excite atoms that are not usually considered suitable for spectrochemical analysis. Qualitative or quantitative analysis of solids, liquids, or gases may be performed by appropriate choice of sample introduction and spectrometer. There is no explosive hazard, and no toxic fumes are generated by the plasma. It is uniquely suited to optical emission analysis of solutions but it may also be used for atomic absorption or fluorescence excitation where its high temperature and inert atmosphere are advantageous for dissociating refractory or reaction samples. The argon plasma is capable of exciting a larger number of elements from a wider variety of samples than any other single source. The argon plasma is available as a routine tool for spectrochemical analysis.

32491 **APTIC NO. 55171**

Fiorentina, H. Della

GRANULOMETRIC COMPOSITION OF WORKPLACE DUSTS. *(La granulometrie des poussieres aux postes de travail). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 24(337):547-552, Dec. 1971.*

The effects of fine respirable dust on the human organism are reviewed, methods of dust sampling for granulometric studies are surveyed, and results of particle countings by three different methods are compared. The lung retention was highest for dust fractions of 5 to 1 micron, and of another fraction in an order of magnitude of a few hundredths of a micron, which is due to sedimentation for large particles, and to the Brownian motion of the finest fraction, respectively. Fine dust particles may enter the alveolar blood where they can exert their toxic effect. The sampling of respirable dust is possible by means of cascade impactors, impingers, paper, glass-fiber, cellulose acetate or tetrachloronaphthalene filters, thermal or electrostatic precipitation, or sedimentation techniques. Visual microscopic counting as well as Coulter and Royco particle counters are available for granulometric analysis. Comparative countings of talc, lead glass, and sand-blasting-generated dusts by means of visual microscope, Royco and Coulter particle counters revealed good agreement of the results furnished by the Royco and Coulter particle counters, and greatly different results of the microscopic counting, manifesting itself in the reduced particle count for the particle diameter range below 2 micron. The error involved in microscopic counting may amount to + or 15%.

32492 **APTIC NO. 54253**

Gordon, G. E., W. H. Zoller, E. S. Gladney, and A. G. Jones

TRACE ELEMENTS IN THE URBAN ATMOSPHERE. *American Nuclear Society, Proc. Am. Nucl. Soc. Top. Meet. Nucl. Meth. Res., Columbia, Mo., 1971, p. 30-37. 27 refs. (Aug. 23-24.)*

Trace element concentrations in the urban atmosphere can be studied with the use of nuclear and nuclear-related analytical techniques, especially instrumental neutron activation analysis. Some elements arising from man-made sources are identified by the normalization of absolute atmospheric concentrations to abundances of the same elements in sedimentary rocks. Elemental concentration patterns of urban particulates can be resolved into contributions from various major source types with moderate success. Such resolutions could be improved, however, if more detailed information on characteristics of emissions from major sources were available. Other analytical methods were reviewed, including electron spectroscopy for chemical analysis and nondispersive x-ray fluorescence following excitation by gamma- or x-rays or by charged particles from nuclear accelerators. Sources of trace elements are also mentioned. (Author abstract modified)

32493 **APTIC NO. 55086**

Herrick, Robert A.

PARTICULATE MEASUREMENTS IN THE ATMOSPHERE. *Preprint, 6p., 1972. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 23rd, Cleveland, Ohio, March 6-10, 1971, Paper 287.)*

Standardization of various techniques for the sampling and measurement of particulate matter is discussed. Three commonly used methods are the high volume sampler, consisting of a blower which draws air through a high efficiency fiberglass filter; a method for dust fall measurement, consisting of an open mouth jar into which dust falls; and a soiling index, which involves the drawing of ambient air through a filter paper, followed by measurement of the reduction in optical transmittance. Instruments available for evaluating reductions in visibility are: the transmissometer, which has a drawback in that measurements cannot be made for ranges over about one-half mile; and the nephelometer, which has the disadvantage of providing a point measurement of visibility only over the path length of the instrument, which is usually less than 1 m. The British Medical Research Council and the Atomic Energy Commission developed a mathematical statement of the average particulate penetration into the deeper part of the human lung based on aerodynamic particle size, and the American Conference of Governmental Industrial Hygienists developed a similar curve. Air sampling devices have since been developed to match the general characteristics of these curves. They are based on a gravitational settling accomplished by passing the air over a stack of horizontal plates and the use of accelerated gravitational forces in a cyclone. The cyclone is the method of choice for ambient air sampling. Various other methods which show promise for particulate measurement are: devices based upon particle deposition through the use of accelerated gravitation, samplers which utilize gravitational force, optical particle counters, condensation nuclei counters, phase microscopy, electron microscopy, and x-ray diffraction.

32494 **APTIC NO. 55060**

Muggli, Robert Z.

X-RAY DIFFRACTION OF SMALL PARTICLES. *Preprint, 1p., 1972. 2 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 23rd, Cleveland, Ohio, March 6-10, 1971, Paper 293.)*

Good x-ray diffraction patterns were formerly obtainable for multicrystallite samples less than 10 micron in diameter. Excessive darkening of the background on the film can be reduced by using a modified 57.3 mm powder camera. Air is removed from the camera by flooding the camera with a gas such as helium or by replacing the air in the camera with a vacuum, and the reduction of the camera s diameter is achieved by placing a cartridge in the camera to reduce the inner diameter. With such an instrument, the x-ray diffraction pattern of particles as small as 2 micron can be determined. Analysis time is reduced. Sensitivity is increased with no appreciable sacrifice in resolution.

32495 **APTIC NO. 55061**

Rendina, John F.

ESCA ANALYSIS OF SOLIDS AND GASES UTILIZING SPECIAL SAMPLING TECHNIQUES. *Preprint, 2p., 1972. 2 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 23rd, Cleveland, Ohio, March 6-10, 1971, Paper 273.)*

The anlaysis of solid samples by x-ray induced photoelectron spectroscopy (ESCA) is a surface technique, with the depth of analysis limited to the range between 10 and 50 A. It is necessary to prepare or clean the sample under high vacuum conditions and analyze it without any exposure to reactive components. A special cryogenic pumping system has been incorporated in the sample chamber of the McPherson Instrument Corporation ESCA 36, which creates a vacuum situation preventing th buildup of residual gases on the sample for at least 24 hours. Two techniques for sample preparation and cleaning of solid samples in situ are evaporation under high vacuum and argon ion etching under vacuum. Studies of the excited states of ionized gases by VUV induced photoelectron spectroscopy is an important aspect of ESCA. The electron analyzer portion of the McPherson ESCA 36 Photoelectron Spectrometer is very well suited for VUV induced photoelectron spectroscopy.

32496 **APTIC NO. 55062**

Rotheram, M. A.

ATMOSPHERIC CONTAMINANT DETECTION BY MASS SPECTROMETRY. *Preprint, 1p., 1972. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 23rd, Cleveland, Ohio, March 6-10, 1971, Paper 197.)*

A system has been developed for the detection and identification of low concentrations of atmospheric contaminations. An accumulator cell inlet system which contains sorbents for the extraction of contaminants from the atmosphere at ambient temperature is used. By heating the cell, the concentrated contaminants are desorbed to a mass spectrometer for identification and quantitative determination. The system was tested in the laboratory using various contaminants, including ammonia, benzene, carbon dioxide, hydrogen sulfide, methane, nitric oxide, and sulfur dioxide. The system proved capable of detecting some contaminants at concentrations of less than 1 ppm, and most were detectable at concentrations of 1 ppm. The precision was about 20% at the 1 ppm level. The results obtained for individual contaminants did not vary according to whether they were tested alone or in mixtures with other contaminants.

1970

32497 **APTIC NO. 55173**

Boyle, Walter G., Jr.

COMBUSTION METHODS FOR CARBON AND SULFUR. *In: Techniques of Metals Research. R. F. Bunshah (ed.), Vol. 3, Part 1, New York, John Wiley and Sons, Inc., 1970, Chapt. 4, p. 115-141. 61 refs.*

Applications and techniques for the determination of sulfur and carbon in metallurgical samples by the combustion method are presented. The combustion method of determination consists of heating the sample in a furnace, burning it in a flowing stream of oxygen, and allowing for the release of the resulting carbon dioxide or sulfur dioxide into the flowing oxygen for quantitative determination. Usually, the recovery of sulfur as sulfur dioxide is only about 90%, and combustion must occur at temperatures around 1550 C to prevent appreciable amounts of sulfur from being retained in the melt. Most of the sulfur not recovered as SO2 occurs as sulfur trioxide adsorbed on the glass surfaces of apparatus employed, with the path length of the glass appuratus made as short as possible and an oxygen flow rate of 3-5 l/min employed, recoveries can be considerably improved. Manganese dioxide is usually used in the oxygen purification system for sulfur determination since it is capable of removing nitrogen dioxide and sulfur for flowing gas streams; sulfamic acid has been used to destroy nitrogen dioxide when using a colorimetric finish for sulfur dioxide. The induction furnace technique and the resistance furnace technique are the two primary methods of oxygen combustion in use. The induction furnace allows rapid heating of the sample and rather high temperatures but sacrifices some degree of control over the rate of combustion. Detection techniques for CO2 include conductometric and titrimetric methods and gas chromatography. Sulfur dioxide can be determined by chemical methods such as colorimetry and physical methods such as gas chromatography.

32498 **APTIC NO. 54686**

Carle, Glenn C.

GAS CHROMATOGRAPHIC DETERMINATION OF HYDROGEN, NITROGEN, OXYGEN, METHANE, KRYPTON, AND CARBON DIOXIDE AT ROOM TEMPERATURE. *J. Chromatographic Sci., vol. 8:550-551, Sept. 1970. 9 refs.*

A simple gas chromatographic system with minimal power requirements proposed for use in a life detection device for landing on Mars was developed to determine hydrogen, nitrogen, oxygen, methane, carbon dioxide, and krypton (an internal standard). The system consisted of a column packed with phosphoric acid-treated Porapak Q and maintained at 20 C in conjunction with a microbead thermistor detector. The resolution of nitrogen and oxygen was 98%, and methane was well resolved from krypton. While hydrogen was capable of giving a negative deflection using helium as the carrier gas, the respiratory production in this investigation did not reach the necessary concentration to cause this anomaly. The carbon dioxide peak was fairly symmetrical. Although carbon monoxide and argon were not adequately resolved from oxygen with the columns used, these gases are generally not of interest in microbial respiration studies. The sensitivity of the chromatograph was excellent, and the following minimum detectable limits were obtained for a sample loop volume of 100 microliter and a signal-to-noise ratio of 2 at a 25 microvolt noise level: H2, 0.00250 micromoles; CH4, 0.000385 micromoles; CO2, 0.000250 micromoles; krypton, 0.000100 micromoles; O2, 0.0000680 micromoles; and N2, 0.0000524 micromoles.

1957

32499 **APTIC NO. 54791**

Drozin, Vadim George

THE DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION OF AEROSOLS BY PRECIPITATION OF CHARGED PARTICLES. *Columbia Univ., New York, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1957, 71p. 35 refs.*

Methods for the determination of particle size distribution based upon measuring macroscopic properties of a large number of particles were investigated. The electric current carried by a large number (approximately 10 to the 8th power) of particles charged in a corona discharge and precipitated in an electric field, when measured as a function of precipitation time, is one such property. The number of charges acquired by particles is a single-valued function of particle size. From the knowledge of this function and measured values of current versus time, the size distribution curve can be determined. The entire procedure, including the necessary calculation, takes about 20 min, and requires relatively inexpensive equipment. All experiments were carried out with particles in the submicron range, the most difficult, and at present, the most important range for the determination of particle size distribution. The three methods developed theoretically are based on the precipitation of charged particles in a gravitational, a centrifugal, and an electrostatic field. The size distribution of aerosol particles in a sample was successfully determined by the third method, which was developed and checked experimentally. (Author abstract modified)

1954

32500 **APTIC NO. 54671**

Dorain, Paul Brendel

THE DIELECTRIC PROPERTIES OF AEROSOLS. *Indiana Univ., Bloomington, Dept. of Chemistry, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1954, 62p. 22 refs.*

A method by which the mass concentrations of aerosols can be measured independently of other parameters, such as number concentration and radius distribution, was developed. Existing theories show that the difference in dielectric constant between an aerosol and the supporting medium, called the dielectric increment, is proportional to the mass concentration of the aerosol and is independent of the particle size. A Birnbaum microwave refractometer was constructed and used to measure the dielectric increment of dioctyl phthalate and triethylene glycol di(2-ethyl butyrate) aerosols. These measurements show that the theories are correct within the experimental errors. The results also indicate that measurements of the dielectric increment may be used to estimate mass concentration independently of particle size at concentrations greater than 20 micrograms/l. (Author abstract modified)

32501 **APTIC NO. 55166**

McCabe, Louis C.

ATMOSPHERIC POLLUTION PROBLEMS OF DEFINING AND CONTROLLING UNDESIRABLE ODORS WERE CONSIDERED AT A RECENT ASTM MEETING. *Ind. Eng. Chem., 46(8):87A-88A, Aug. 1954. (Presented at the American Society for Testing Materials, Annual Meeting, 57th, Chicago, Ill., June 13-18, 1954.)*

The problem of controlling undesirable odors in hospital aircraft where it was important not to interfere with alarm or signal odors has led to the development of mixing units and methods for appraising mixtures of three kinds of odorants which may be applicable to the investigation of a variety of problems in air contamination. The assembly is designed to provide mixtures of malodors, control agents, and alarm motors in clean air under conditions convenient for varying one or more constituents, for changing the contact time, and for providing sufficiently large samples to permit periodic appraisal without disturbing the composition of the mixture. The results are reproducible and lend themselves to graphic representations in which the effect of the separate components can be readily seen. A portable and a fixed instrument and which employ the catalytic method for measuring hydrocarbon concentrations in industrial exhaust fumes have also been developed. These instruments are satisfactory for measuring unit energy release through temperature rise resulting from catalytic combustion of exhaust gases and give a convenient and reliable means for determining total hydrocarbons. Methods now commercially available for control of odors by treatment of the odorous air may generally be divided into four classifications: combustion, adsorption, absorption, and use of odor modifiers. Examples and applications for each category are provided. Discussion of the problem of defining odors is concluded with the contention that the sniff method by trained observers is the most practical means of determining and describing odor level.

1943

32502 **APTIC NO. 55115**

Dohrman, H. C.

PARTICLE SIZE ANALYSIS OF FLY ASH. *Preprint, Buell Engineering Co., Lebanon, Pa., 9p., 1943.*

The means available for determining fly ash particle size may be classified into two general categories: one in which the dust sample is segregated into fractions with respect to particle dimensions (accomplished by screening or by microscopic examination and count); and one which is based on the principle of segregation of the fractions with respect to the terminal velocities of the particles in a fluid (including air elutriation and sedimentation in a liquid). Whily the screening method is useful in determining the nuisance value of fly ash, the lower limit of particle size determination with this method is 43 micron. In order to obtain an analysis below 43 micron, it is necessary to resort to either the air elutriator or sedimentation methods. The latter is not applicable to the analysis of fly ash if particles are present which float on top of the fluid or tend to agglomerate. The most satisfactory method of fly ash analysis is air elutriation, in which a dust sample is subjected to an ascending stream of air in a tube of a definite velocity. Since both elutriation and sedimentation tests yield results in terms of terminal velocities the results are usually translated into the more familiar form of particle dimensions using Stokes Law, and terminal velocities are thus converted into equivalent particle sizes. In predetermining the collection efficiency of a proposed installation, analysis of the dust to be handled will yield an accurate prediction if the performance characteristic of the collector is known.

AIR QUALITY MEASUREMENTS

1973

32503 **APTIC NO. 54923**

Kitakyushu Municipal Government (Japan), Environmental Protection Div.

ENVIRONMENTAL POLLUTION IN KITAKYUSHU CITY, FISCAL 1973. *(Showa 48-nendo ban, Kitakyushu-shi no kogai). Text in Japanese. no. 7, 512p., Sept. 1973.*

This annual report on various types of public nuisance includes the Kitakyushu Municipal plans for air pollution monitoring, control, and the general trends based on the records of monitoring for the past year. The highest yearly average of sulfur dioxide based on hourly measurements was 0.045 ppm at the Wakamatsu monitoring station, and the maximum hourly measurement was 0.289 ppm (in May) of the Tobata Monitoring Station. Compared to 1971, the annual averages decreased at four stations, and slightly increased at five. Generally the measurements are low in summer and high betweeen Feb. and May. The atmospheric pressure pattern when SO2 is over 0.1 ppm is the mobile high pressure front and this occurred 108 times in 1972; the next highest was the high east and low west type, which occurred 81 times when the SO2 measurements were high. The lead dioxide method of SO2 measurements resulted in approximately a 12% reduction compared to 1971. Suspended particulate yearly averages at various locations ranged between 0.023 and 0.06 mg/cu m/hr. As of March 31, 1973, the number of factories under the Air Pollution Control Act was 505, and that of soot and smoke emission sources was 1791. Factories increased by 7.9% since 1971 and soot and smoke emission sources increased by 4.3%. Most sources are boilers and metal furnaces. Dust sources are 1073 and have increased by 8.8% since 1972. The environmental standard achievement programs, programs for the protection of children, bad odor conditions, and control programs, are also discussed.

32504 **APTIC NO. 55187**

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

AIR QUALITY DATA FOR NONMETALLIC INORGANIC IONS 1969 AND 1970 FROM THE NATIONAL SURVEILLANCE NETWORKS. *APTD-1466, 79p., June 1973. 3 refs.*

NTIS: PB 223630

Particulate pollutant data gathered during 1969 and 1970 by the cooperating stations of the National Air Surveillance Networks provide the basis for listing the urban and nonurban concentrations of four nonmetallic inorganic ions: ammonium, fluoride, nitrate, and sulfate. Laboratory methodology for each nonmetallic inorganic constituent is described. The data for ammonium, nitrate, and sulfate are presented as cumulative frequency distributions. Because there were no nonurban fluoride measurements above the detectable concentration, the table showing nonurban concentrations of fluoride is abbreviated. (Author abstract modified)

32505 **APTIC NO. 54506**

Chatot, G., R. Dangy-Caye, and R. Fontanges

STUDY OF AIR POLLUTION DUE TO POLYCYCLIC AROMATIC HYDROCARBONS IN THE LYON REGION BY MEANS OF TWO COLLECTORS WITH DIFFERENT PRINCIPLES OF OPERATION. *(Etude de la pollution atmospherique par les arenes polynucleaires dans la region Lyonnaise a l aide de deux collecteurs de principe different). Text in French. Atmos. Environ., 7(8):819-826, Aug. 1973. 13 refs.*

A quantitative study was made of 13 polycyclic aromatic hydrocarbons in atmospheric dust, collected by two different samplers (a selective sampler developed by Fontanges, and non-selective, high-volume STAPLEX TF 1 A2-220 V model sampler) in the Lyon region with the respective prevalent emissions from diesel engine, coal-fired, and wood-fired domestic heating equipment. The dust particle size appeared to have no influence on the total amount of such hydrocarbons absorbed. Thin-layer chromatographic, gas chromatographic, and ultraviolet spectrophotometric analyses revealed the prevalence of derivatives of pyrene and fluoranthene (benzo(b)fluoranthene). The proportion of the polycyclic aromatic hydrocarbons to total dust in the city center was similar to that observed in other large urban agglomerations. The total amount of the polycyclic aromatic hydrocarbons in dust samples from coal-, fuel oil-, and wood-firing averaged 238, 140, and 71 micrograms/g of dust. The dust hydrocarbon content reached an average of 1.07 micrograms/g in winter to fall and 290 micrograms/g in summer, which indicates the major contribution of domestic heating to polycyclic aromatic hydrocarbon-generated air pollution.

32506 **APTIC NO. 54948**

Dale, I. M., H. J. Duncan, and C. McDonald

NEUTRON ACTIVATION ANALYSIS OF ATMOSPHERIC PARTICULATES. *Radiochem. Radioanal. Lett., 15(2):77-86, Sept. 1973. 8 refs.*

Dust samples collected from the atmosphere of a large industrial city were analyzed for 16 elements by nondestructive neutron activation analysis. Two irradiations were required, one of 15 min at 3 times 10 to the 12th power n sq cm power/sec and one of 96 hr at 6 times 10 to the -12th power n cm to the -2nd power/sec. Measurement of the induced radioactivity was carried out by using a 60 cc germanium lithium detector coupled to a computer controlled multichannel analyzer. The concentration of sodium, manganese, and bromine are presented. The accuracy of the analysis, estimated from counting statistics and reproducibility of replicate analyses, for Na, Mn, Br and zinc is + or 10%, for the other elements it is + or - 25%. The results for similar industrial cities in the United States and Great Britain are also given. The analyses indicate the wide variation in metal content of atmospheric particulates and the significance of meteorological and other factors to these variations is being investigated. In spite of these fluctuations in element concentrations, the mean values obtained are generally in agreement with results quoted for East Chicago and Glamorgan. (Author abstract modified)

32507 **APTIC NO. 54432**

Daniel, Wayne A. and Jon M. Heuss

AMBIENT AIR QUALITY AND AUTOMOTIVE EMISSION CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1973. 19 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-72.)*

Some uncertainties associated with projections of ambient air quality made with the proportional model are considered. Ambient air quality was projected by assuming a linear dependence on estimated future emissions. Future automotive emissions were estimated by a method recommended by EPA. Projections were made for the locations reported to have the highest ambient air concentrations of each pollutant: Chicago for carbon monoxide, and the California South Coast Air Basin for hydrocarbons and oxidants. The sensitivity of the projections to several air parameters was determined. The uncertainty in projection of air quality due to the use of a maximum, one-per-year concentration is large. For example, the reduction in total CO emissions in Chicago in 1975, necessary to meet the air quality standard, was as high as 68% or as low as 26%, depending on whether the historic high, 8-hour average concentration of 44 ppm or the 1970 maximum of 21 ppm was used. The effects of uncertainties in growth rates and fraction of emissions attributed to the automobile were also sizeable. Differences in automotive growth rate had a large near-term effect on projected concentrations, while differences in non-automotive growth rate or fraction of emissions attributed to the automobile had a large long-term effect. The effect of 1975 interim automotive emission standards on projected air quality was negligible when compared with projected air quality based on the previous Federal automotive emission standards for 1975. (Author abstract modified)

32508 **APTIC NO. 54853**

Derouane, Alain and Geert Verduyn

COMPARISON OF THE SO2 CONCENTRATIONS INDOORS AND OUTDOORS OF TWO BUILDINGS. *(Comparaison des concentrations en SO2 a l interieur et et a l exterieur de deux batiments). Text in French. Atmos. Environ., 7(9):891-899, 1973. 11 refs.*

A comparison between sulfur dioxide concentrations measured indoors and outdoors at two sampling points is presented. The measurements were made during 14 months in a 100-year-old administrative building, and 36 months in a private home built 35 years ago. The results show that the indoor concentrations represent commonly 15-20% of the outdoor concentrations during the winter months, and 40-50% during the summer months. The value of the correlation coefficient between these concentrations is higher for the older building. The age and the nature of the indoor wall covering seem to be among the factors that influence the ratio of the indoor to the outdoor SO2. (Author abstract)

32509 **APTIC NO. 54341**

Kimura, Kikuzi

SOME PROBLEMS CONCERNING THE ENVIRONMENTAL CONDITIONS IN OFFICE ROOMS. *(Jimushitsunai no kankyo to 2,3 no mondaiten). Text in Japanese. Rodo Kagaku (J. Sci. Labour, Tokyo), 49(8):425-447, Aug. 1973. 48 refs.*

Some of the problems relating to the environmental conditions within office buildings are discussed. Since office workers often do not feel comfortable even when the environmental conditions are satisfactory, the opinions of office workers were obtained concomitantly with more scientific measurements. The following points are discussed: the relationship between the measurement data and the worker evaluations regarding parameters such as temperature, air contamination, noisiness, and illumination; the opinions of smokers versus nonsmokers regarding cleanliness of the air; the relationship between the overall evaluation of the environment and the evaluations of the individual factors; and the relationship between the workers comfort evaluations and their health status. The relationship between particulate matter in supplied air and in the office air and the hourly variation in particulate concentration in offices located in urban and suburban areas were discussed. Indoor and outdoor dust concentrations were compared with and without air conditioning.

32510 **APTIC NO. 54924**

Ladinskaya, Leonora A., Yuriy D. Parfenov, Dmitriy K. Popov, and Antonina V. Fedorova

PB(210) AND PO(210) CONTENT IN AIR, WATER, FOODSTUFFS, AND THE HUMAN BODY. *Arch. Environ. Health, 27(4):254-258, Oct. 1973. 22 refs.*

Concentrations of (210)lead and (210)polonium in air, drinking water, foodstuffs, and human tissues are reported. The mean concentrations in ground-level air for (210)Pb and (210)Po, respectively, are 17.0 times to the minus 3 pCi/cu m and 3.6 times 10 to the minus 3 pCi/cu m. Both of these elements are washed from the air by rain and snow without separation. The main route of (210)Pb and (210)Po intake in the human body is ingestion with foodstuffs. The absorption coefficient of (210)Po into the blood from the digestive tract was estimated to be 35%. The highest concentration of (210)Pb and (210)Po in the body was observed in the skeleton and hair. The body burden of humans was 773 pCi of (210)Pb and 513 pCi of (210)Po. Excretion of these radionuclides from the body in urine was 14 to 15 times less than in feces. The calculated annual radiation doses of (210)Po in the bone, liver, and kidneys were 2.1 to 5.0 millirad/yr, and in other soft tissues, 0.3 to 0.9 millirad/yr. (Author abstract modified)

32511 **APTIC NO. 54846**

Lum, R. M. and T. E. Graedel

MEASUREMENTS AND MODELS OF INDOOR AEROSOL SIZE SPECTRA. *Atmos. Environ., 7(8):827-842, Aug. 1973. 21 refs.*

Aerosol quantities and size distributions were measured as a function of time and for suspected sources in a controlled indoor environment. Variations in the total particle count of as much as a factor of five could be directly attributed to personnel shift changes, dry mopping of the floor area, cigar smoking, and chalk dust, and demonstrated the substantial effect of personnel on the aerosol environment of an enclosed area. Significant differences were observed in the characteristics exhibited by controlled and natural aerosols. Indoor measurements indicated approximately r to the -7th power dependence of the aerosol size distribution function in contrast with the r to the -4th value typically determined for naturally occurring aerosols, and a consequent sharp decrease in the mass median diameter and in the aerosol volume fraction (r is the radius of airborne particle). The steepening of the aerosol size spectra was a result of both the air recirculation cycles and the filtration systems which are employed. Theoretical models were developed and utilized to study the effects of air treatment systems as a function of particle size. The close agreement obtained between models and measurements was used to derive engineering techniques by which indoor aerosol environments may be tailored as desired by building design engineers. (Author abstract modified)

32512 **APTIC NO. 54398**

Martens, Christopher S., Jerome J. Wesolowski, Robert Kaifer, Walter John, and Robert C. Harriss

SOURCES OF VANADIUM IN PUERTO RICAN AND SAN FRANCISCO BAY AREA AEROSOLS. *Environ. Sci. Technol., 7(9):817-820, Sept. 1973. 16 refs.*

The origins of vanadium in the San Francisco Bay area and Puerto Rico were investigated by comparing the abundance and particle size distributions of V to that of the other elements found in the atmospheres. In the San Francisco Bay area abundances of V ranged from 2.7 ng/cu m in downtown San Francisco to 12 ng/cu in the much smaller city of Pittsburg. Both soil and combustion appear to be major contributors of V in the San Francisco Bay area atmosphere, the soil providing the larger particles and the combustion the smaller particles. Vanadium sampled in Puerto Rican experiments may be primarily from a soil source. The similar behavior of V and aluminum in Puerto Rican orographic clouds further suggest soil origin for the V, although the soil dust does not appear to have average crustal composition, especially in the case of Al which is depleted. (Author summary modified)

32513 **APTIC NO. 54851**

Martens, Christopher S., Jerome J. Wesolowski, Robert Kaifer, and Walter John

LEAD AND BROMINE PARTICLE SIZE DISTRIBUTIONS IN THE SAN FRANCISCO BAY AREA. *Atmos. Environ., 7(9):905-914, 1973. 19 refs.*

Lead and bromine particle size distributions were measured in the San Francisco Bay area. Samples taken with Andersen impactors during a 4-day period were analyzed by X-ray fluorescence and neutron activation analysis. The results, including approximately 50% mass concentration on the afterfilter, nearly constant Br/Pb ratio at all stations, and the good correlation with carbon monoxide levels, are consistent with the properties of a condensation aerosol from automobiles. No greater loss of Br from the smaller particles was observed, in contradiction to expectations from a diffusion mechanism. (Author abstract)

32514 **APTIC NO. 54860**

Nihira, A. and M. Sone

ATMOSPHERIC POLLUTION STATE IN SENDAI-SHIOGAMA DISTRICT BY SULFUR OXIDES (I). *(Iou sankabutsu ni yoru senen chiku no taiki osen jokyo ni tsuite (I)). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep., no. 1:3-10, May 1973.*

Sulfur oxides pollution generated by thermal power plants in the Sendai-Shiogama district were reviewed. The monthly concentration change of SOx, quarterly iso-concentration lines, quarterly SOx concentrations, and wind directions and velocities noted during high concentrations of SOx are given. Seasonal concentration change is noted, and local change is greater in spring, smaller in winter, and average during summer and fall. Sulfur dioxide concentrations increase with the southeasterly winds that blow in the summer, and decrease with the winter northwesterly winds. Distance to the maximum ground-level concentration and effective stack height was calculated.

32515 **APTIC NO. 54933**

Ridley, B. A., H. I. Schiff, A. W. Shaw, L. Bates, C. Howlett, H. LeVaux, L. R. Megill, and T. E. Ashenfelter

MEASUREMENTS IN SITU OF NITRIC OXIDE IN THE STRATOSPHERE BETWEEN 17.4 AND 22.9 KM. *Nature (London), 245(5424):310-311, Oct. 12, 1973. 1 ref.*

A balloon borne NO2 sampler was flown on March 16, 1973 from Hallomon Air Force Base, N. Mex., 32 deg 50.1 min N, 106 deg 0.7 min W. Measurements were made of nitric oxide between 1040 and 1505 local time, at 17.4 and 22.9 km. The method is based on the chemiluminescence produced when excess ozone is added to a flow of gas containing NO. The total error in the measurements is estimated at 60%. The largest error, about 20-30%, was due to the small count rates observed, and the balance due to the uncertainties in concentration of the calibrating gas mixture, the total volume flow rate, and in the digital tape recording. Within this 60% accuracy, no differences were observed in the measurements taken during ascent, float, and descent modes, indicating that there were no serious contamination problems associated with the sampling of the ambient air either from interference from the exhaust or from outgassing of the balloon or instrument package. Most of the measurements were made between 20.1 and 22.9 km. No differences in NO mixing ratio were observed over the altitude range 17.4 to 22.9 km within the experimental error. The average value of the NO mixing ratio was found to be 0.1 parts per 10 to the 9th power by volume + or 60%.

32516 **APTIC NO. 54958**

Thompson, C. Ray, Earl G. Hensel, and Gerrit Kats

OUTDOOR-INDOOR LEVELS OF SIX AIR POLLUTANTS. *J. Air Pollution Control Assoc., 23(10):881-886, Oct. 1973. 7 refs.*

The levels of six air pollutants were compared inside and outside 11 buildings in the South Coast Basin of California during summer and fall. The pollutants are total oxidant, peroxyacetyl nitrate (PAN), nitric oxide, nitrogen dioxide, carbon monoxide, and particulate matter. The levels of particulate matter within buildings depend largely upon the velocity of air movement. Indoor areas where foot traffic was light or ventilation rates were low, had reduced particulates, but with high rates of air exchange, particles remained airborne. Electrostatic precipitators were much more effective in removing particles than the coarse primary filters used in many buildings. Oxidant levels inside depended upon how much was being brought in from outside and residence time in the structure. Ozone decays rapidly enough so that levels of 2/3 those outside or much less can prevail. Peroxyacetyl nitrate, being more stable than ozone, persisted longer inside, but the amounts also depended upon how much was being brought in and the residence time in the low light intensities that prevail inside. Oxides of nitrogen and CO are carried into all structures by ventilation. Elevated levels inside were found where auto exhaust or combustion gases were drawn in and circulated, but oxides of nitrogen were significantly lower inside structures, especially those with refrigerated air conditioning. (Author summary modified)

32517 **APTIC NO. 54179**

Tomita, Kinuko, Toshio Kawaraya, and Takahiro Haruki

THE AMOUNT OF POLYCYCLIC HYDROCARBONS IN THE AIR OF OSAKA CITY (NO. 3). *(Osaka shi taiki chu takan tanka suiso ryo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(9):525-532, Sept. 1973. 17 refs.*

Benzo(a)pyrene in floating dust, tar, and hydrocarbons in the air of Osaka were measured by area and grain size from 1969 to 1972. The amount of HC in flue gases from heavy oil boilers, one of the main emission sources, was also measured. The amounts of dust, tar, and HC in flue gas decreased in the order heavy oil C, heavy oil B, heavy oil A, and kerosene. Measurements of dust, tar, and benzo(a)pyrene were higher in industrial than in residential areas and decreased in the order of winter, spring, autumn, and summer. Dust less than 7 micron in diameter was 56% of the dust in winter and 60% of the dust in summer; tar occurred in 81% of the dust in winter and 91% in summer; benzo(a)pyrene was about 90% in winter and summer.

32518 **APTIC NO. 54709**

Volchok, H. L., L. Toonkel, and M. Schonberg

APPENDIX C: RADIONUCLIDES AND LEAD IN SURFACE AIR. *In: Health and Safety Laboratory Fallout Program; Quarterly Summary Report. (December 1, 1972 through March 1, 1973.) p. C1-C7, C104-110, 1973. 6 refs.*

NTIS: HASL-273 Appendix

Since Jan. 1963, the Health and Safety Laboratory has been conducting the Surface Air Sampling Program. The primary objective of this program is to study the spatial and temporal distribution of nuclear weapon debris and lead in the surface air. The sampling network, consisting of land stations and Atlantic Ocean weather ships, extends from about 81 deg North to 90 deg South. About 1400 to 2200 cu m/day of ambient air are collected and filtered, with the filters being composited into monthly samples for analysis. The gamma spectra of half of the monthly composites are obtained at HASL, with the other half of the monthly composites go to various contractor analytical laboratories for radiochemical analyses. As the levels of any of the radionuclides drop to below practical detection limits, they are eliminated from the radiochemical program. In response to the growing concern over the air pollution hazard linked to stable lead, analysis for this element was added to the program. Three types of quality control samples are submitted to the analysts along with each shipment of air filters: spiked samples; blank filters; and duplicate samples. The activity concentrations for all of the radionuclide, gross gamma, and stable lead analyses completed to date are reported.

32519 **APTIC NO. 54413**

Woolrich, Paul F.

OCCURRENCE OF TRACE METALS IN THE ENVIRONMENT. AN OVERVIEW. *Am. Ind. Hyg. Assoc. J., 34(5):217-226, May 1973. 14 refs.*

The occurrence of trace metals in the environment are discussed in a review of the technical literature. Particular attention is given to metals as airborne contaminants. Beryllium, antimony, bismuth, tin, nickel, cadmium, lead, and mercury are counted as occupational medical problems in the industrial environment. Their principal harm is that they tend to displace physiologically desirable elements belonging to the same periodic group, thereby upsetting what appears to be natural balance. Other than such occupational exposures, trace metals in the air are not currently threatening the health of the public. Tissue and air levels of trace metals are discussed, as well as the human intake of metals from the air, elements detected in suspended particulates in urban areas are listed.

1972

32520 **APTIC NO. 54891**

Abe, Koji and Toshihiko Seki

THE CONCENTRATION OF OXIDANT IN THE AIR OF SENDAI CITY. *(Sendai shinai ni okeru taikichu okishidanto nodo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 3:188-193, March 1972. 2 refs.*

Oxidant pollution in the air of Sendai was studied using the neutral potassium iodide method. The maximum value was 0.049 ppm in August, and the average value was 0.011 ppm. The maximum value was 1/7 of that measured at the same time in June and July in Tokyo, and the average value was about 1/10 that in Tokyo. The average value of oxidant on a fine day was about three times that of a cloudy day. A clear day has two peaks between 10 and 11 am and between 12 and 1 pm. On a cloudy day, the change in the concentration of oxidant was trifling, and the peak appeared between 11 and 12 pm. The behavior of nitrogen oxides is important to the first stage of the photochemical reaction. Nitrogen oxides and sulfur oxides may possibly reduce the value of the oxidant.

32521 **APTIC NO. 54901**

Abe, Koji, Yasuko Inoue, and Toshihiko Seki

INVESTIGATION OF AIR POLLUTION (NO. 10)--FLOATING DUST BY HI-VOLUME AIR SAMPLER AND ITS COMPONENTS. *(Taiki osen ni kansuru chosa kenkyu (No. 10)--haiboryumu ea sampura-ho ni yoru fuyufunjinryo to sono ganyu seibun ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic Rep. Inst. Pub. Health), no. 3:174-187, March 1972. 8 refs.*

Air quality measurements were carried out in Sendai by use of a Hi-volume sampler. The filter in the sampler collected floating dust, extracted tar, and determined heavy metals and nonmetal components such as iron, zinc, manganese, chromiun, copper, cadmium, lead, sulfate, and nitrate. The concentration of floating dust in winter was 23.1% and 14% in the summer. The concentration of floating dust in winter was 1.7 times that of the summer season. The tar content of the floating dust was 23.1% in the winter, and 14.0% in the summer. The nitrate was 16.7-0.5 micrograms/cu m and the sulfate was 31-3 micrograms/cu m. The amount of Pb in the winter was 3.3 times that of the summer season.

32522 **APTIC NO. 55042**

Galbally, Ian E.

OZONE AND OXIDANTS IN THE SURFACE AIR NEAR MELBOURNE, VICTORIA. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 192-198. 33 refs. (May 15-18.)*

An analysis of seven years of daily measurements of ozone in the surface air at Aspendale, Australia, situated 30 km southeast of the center of Melbourne s industry, commerce, and traffic, shows a marked and continuing increase in the ozone concentration since 1968. A comparison of observations at Aspendale and at rural sites during 1967, 1968, and 1970 indicates this ozone increase to be of urban origin and probably due to an increase in oxidant-type air pollution in the urban air near Melbourne during the last four years. The monthly mean ozone concentrations as measured by the Ehmert method for the period February, 1965 to November 1971 are presented in graphical form. Distribution of ozone concentrations at Aspendale and rural sites in 1967, 1968, and 1970 are also provided. Photochemical production of ozone and long term and diurnal variations of ozone are mentioned.

32523 **APTIC NO. 55041**

Glowiak, Bohdan J. and Ryszard J. Palczynski

DEPENDENCE BETWEEN RADIOACTIVITY AND CONCENTRATION OF ATMOSPHERIC AEROSOLS. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 155-161. 9 refs. (May 15-18.)*

An investigation of the natural radioactivity of atmospheric aerosols and the degree of dust concentration in the air in the Wroclaw area (a large city in Poland) over a 2-year period in order to study the dependence, if any, between concentrations of aerosols and their radioactivity. Air was pumped through a blotting paper band filter, and the radioactivity of precipitated aerosols was measured by means of a Geiger-Muller counter. Solid air pollutants had radioactive properties, caused, first of all, by the presence of natural isotope products of radon and thoron decay. Radioactive concentrations within the limits from 0.05 times 10 to the minus 10 to 12.18 times 10 to the minus 10 micro Ci/cu m with a mean value of 1.7 times 10 to the minus 10 micro Ci/cu cm were observed. Concentration of aerosols was measured by means of a photometric method which determined the degree of filter blackening, and measurements were expressed in dimensionless units based on a pattern scale. Correlation coefficients, standard deviations, and the parameters of the regression equations of each measurement series were calculated; and the investigation showed that the dependence between concentration of atmospheric aerosols and their radioactivity could be described by exponential equations with correlation coefficients ranging from 0.708 to 0.853. (Author abstract modified)

32524 **APTIC NO. 54900**

Hoshikawa, Hidehiko, Koji Abe, and Toshihiko Seki

INVESTIGATION OF AIR POLLUTION (NO. 8) -- THE AMOUNT OF FALL DUST AND SULFUR OXIDES IN THE PAST TWO YEARS IN SENDAI CITY. *(Taiki osen ni kansuru chosa kenkyu (No. 8) -- Sendaishi ni okeru kako ninenkan no koka baijin oyobi iosankabutsu ryo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 3:134-153, March 1972. 5 refs.*

Dust and sulfur oxides were measured in Sendai during 1970 and 1971. Dust was collected in a 6 l dust jar for 1 month and the ash and tar content of the soluble and insoluble residue was analyzed. Sulfur oxides were measured by the lead oxide method. The average annual dust fall was 5.21 t in 1970, and 5.20 t in 1971. The average value classified by area was 7.58 t in 1970 and 7.22 t in 1971 at Norinchukin. At the Sendai Municipal Institute of Public Health, the average value was 2.84 t in 1970 and 3.17 t in 1971. The annual average value of SOx was 0.45 mg in 1970 and 0.37 mg in 1971. The maximum value by area in 1970 was 0.66 mg at Ushigoyacho and 0.47 mg at Norinchukin. In 1971 it was 0.47 at Norinchukin.

32525 **APTIC NO. 54899**

Inoue, Yasuko, Koji Abe, and Toshihiko Seki

INVESTIGATION OF AIR POLLUTION (NO. 9) -- THE CONCENTRATION INDEX OF FLOATING DUST IN SENDAI CITY IN THE PAST FIVE YEARS BY TAPE AIR SAMPLER. *(Taiki osen no chosa kenkyu (No. 9) -- tepu ea sanpura-ho ni yoru saikin gonenka no Sendai shinai no fuyujin nodo shisu ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic Rep. Inst. Pub. Health), no. 3:154-173, March 1972.*

Measurement of dusts in the air of Sendai was carried out with a tube-type air sampler. Air was sucked in at a rate of 10 l/min and adsorbed on a tape-shaped filter paper. The collected dust was measured with a dust meter, and the relative concentration was converted into the concentration index of floating dust. The annual average value was 4.4% in 1967, 4.0% in 1968, 3,9% in 1969, 4.3% in 1970, and 4.1% in 1971. The average value by season was 6.6% in winter, 4.3% in spring, 3.7% in autumn, and 2.2% in summer. The average concentration by day of the week was 7.0% for Monday through Friday in winter, and 5.9% on Saturday and Sunday. Changes in concentration due to time was 3 to 4% between 12 and 2 am, 8.3% at 8 am, 3,3% at 12 am, and 10.5% at 6 pm.

32526 **APTIC NO. 55286**

Kitamura, T., T. Ogura, M. Katada, N. Osaki, M. Kondo, K. Takeda, and K. Yoshizumi

SURVEY OF THE AIR POLLUTION IN TOKUSHIMA PREFECTURE. PART XIV. MEASUREMENT OF HYDROGEN SULFIDE CONCENTRATIONS. *(Tokushima-ken ni okeru taiki osen chosa. Dai 14 ho. Ryuka suiso nodo no sokutei kekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 11:43-48, May 1972.*

Concentrations of hydrogen sulfide in stack gases and in the vicinities of viscose rayon, cellophane, and spinning factories in the Imakiri industrial district of Tokushima Prefecture were measured from July to October of 1971. A maximum of 576.8 ppm of H2S was detected in the stack gases by the zinc amine complex methylene blue method. Since H2S was exhausted not only from duct, but also from many other places like deaeration tanks and the building itself, it was impossible to estimate the total amount of H2S gas exhausted. In the vicinities of factories, 0.3 0.5 ppm of H2S was detected in the downstream-wind direction area.

32527 **APTIC NO. 55287**

Kitamura, T., T. Ogura, M. Katada, and N. Osaka

AIR POLLUTION SURVEY IN TOKUSHIMA PREFECTURE. PART XV. DUST RESEARCHES IN THE VICINITIES OF CHROMATE AND FERRO ALLOY PRODUCING FACTORY. *(Tokushima-ken ni okeru taiki osen chosa. Dai 15 ho. Kuromusan oyobi fero aroi seizo kojo shuhen no funjin chosa). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 11:49-53, May 1972. 3 refs.*

Air pollution in the Tachibana bay area in Tokushima Prefecture is caused by a chromate and alloy factory. Dust fall was 6.776 tons/sq km/mo (mean) and 10.105 tons/sq km/mo (maximum in April). The mean suspended particulate concentration measured by a high-volume sampler was 110 micrograms/cu m; the maximum was 430 micrograms/cu m. Suspended particulate concentrations measured with a low-volume sampler were less than those determined by a high-volume sampler. Concentrations of chromium (valence six) were 0.0-0.11 micrograms/cu m, except for 0.31-1.92 micrograms/cu m measured near the factory. The concentrations of total chromium were 0.0-0.21 micrograms/cu m. Manganese concentrations in suspended particulates were 0.0-5.0 micrograms/cu m, except for 10-71 micrograms/cu m near the factory.

32528 **APTIC NO. 54204**

Kuriyama, Masayuki

INVESTIGATION ON THE AIR POLLUTION OF AMAGASAKI CITY---DETERMINATIO OF SULFUR DIOXIDE CONCENTRATION AND DUST FALL (NO. 1). *(Amagasaki shi no taiki osen shosa---nisanka io nodo to kokasei baijin no sokutei to sono hendo (dai ippo)). Text in Japanese. Mukogawa Joshi Daigaku Kiyo, Shizen Kagakuhen (Bull. Mukogawa Womens Univ., Nat. Sci.), no. 19:7-11, 1972. 4 refs.*

In Amagasaki, 32 measuring stations were set up to measure sulfur dioxide by the lead dioxide method and dust fall by the deposit gauge. Dust was analyzed for pH, sulfates, tar, carbon, ash, and ignition loss. Sulfur dioxide concentration data are given for each month in different areas. Smog is produced over Amagasaki. Pollution is influenced by seasonal winds. Sulfur dioxide decreased in 1972 over the previous year.

32529 **APTIC NO. 55049**

Merz, P. H., L. J. Painter, and P. R. Ryason

AEROMETRIC DATA ANALYSIS - TIME SERIES ANALYSIS AND FORECAST AN AN ATMOSPHERIC SMOG DIAGRAM. *Atmos. Environ., 6(5):319-342, 1972. 27 refs.*

A time series analysis of air monitoring data for the downtown Los Angeles station has been used to forecast pollutant concentrations. Trends are thereby detectable. Hydrocarbon, total oxidant, and carbon monoxide are trending downward. Nitric oxide is trending upward. Sulfur dioxide and nitrogen dioxide are behaving in a complex manner, and no forecast is possible at this time. These statements are based on analysis of the data to the end of 1969. Somewhat different results were obtained using the data to the end of 1967. This emphasizes the empirical, adaptive nature of the time series forecasting and the need for updating. A smog effect diagram was derived from the air monitoring results. From the regression equation and the standard deviations, mutually interconsistent air quality standards have been derived. A set of these is oxidant:10 pphm; nitrogen oxides:25 pphm; and nonmethane hydrocarbon 0.6 ppm C. If current trends persist, this work indicates the control program is having an effect in the anticipated direction. Emission standards appear to be consistent with the air quality standards on the basis of the analysis for this station. Data from other stations and other locales could also be productively analyzed by the methods used here. (Author abstract)

32530 **APTIC NO. 54714**

Mollenhauer, H. P.

REPORT ON CERTAIN CHEMICALS IN THE ENVIRONMENT IN THE FEDERAL REPUBLIC OF GERMANY. *In: Report on Third Technical Meeting on Occurrence and Significance of Chemicals in the Environment, Berlin (West), 17th-20th January 1972. Organisation for Ecomomic Co-operation and Development, Paris (France), p. 14-24, 1972.*

The environmental occurrence of lead, mercury, and cadmium within the Federal Republic of Germany was studied by a German project group on Environmental Chemicals and Biocides. Within the Federal Republic, the use of mercury amounted to 760 tons in 1969; the uses were both agricultural and industrial. Legal tolerances have been set for the concentrations of this metal in foods and the air surrounding industrial premises, and measures are being taken to reduce the agricultural use of mercury and industrial mercury pollution. Research into the contamination of food by mercury is also in progress. In 1969, 361,000 tons of lead were used in the Federal Republic, with 7000 tons being discharged into the atmosphere. The levels of lead in the air, water, soil, and vegetation of various parts of the country are elevated over natural levels, especially in areas near highways. While lead contamination affects mainly the surfaces of fruits and vegetables, the ingestion of contaminated feeds by livestock has led to the contamination of milk and meat. Canned and bottled products may also be contaminated by lead in their containers. Legal tolerances exist for the lead concentrations in food, motor car petrol, water, and air, and programs have been implemented to further reduce lead pollution and consumption. The use of cadmium in the Federal Republic amounted to 799 tons in 1969; elevated levels of this metal were found in cultivated soils and the air surrounding industrial installations. Legal tolerances exist for the levels of cadmium in food and the atmosphere, and programs have been implemented to reduce the levels of cadmium pollution. The Federal Republic has instituted several other programs to evaluate the occurrence and significance of other environmental chemicals, and efforts are being made to coordinate these programs. The following terms are defined: environmental chemical, and biocides.

32531 **APTIC NO. 55072**

O Heare, J. N.

AIR QUALITY MEASUREMENTS IN THE WILLIAMSTOWN-PORT MELBOURNE AREA. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 169-175. 12 refs. (May 15-18.)*

Results of a Mobile Air Pollution Survey of the Williamstown-Port Melbourne Area taken to obtain background information in connection with a proposed power station to be located at Newport, Melbourne are presented for the period January 1969 to June 1971. The average sulfur dioxide levels measured in 1969, 1970, and the first half of 1971 were 2.8, 1.7, and 1.5 pphm, respectively, for a 30-minute test period; corresponding average 3-minute peak values were 4.0, 2.2, and 2.6 pphm. Average coefficient of haze (COH) measurements (30-minute sampling period) were 1.0, 1.5, and 1.4 respectively. A high degree of correlation between 30-minute average and 3-minute peak SO2 readings (0.96) existed, though correlations between these two variables and COH were lower, being 0.29 and 0.23 respectively. Although small, both of these coefficients were significant at the 99% level. The 30-minute average SO2 concentration obtained over the 2-year period, 1969/1970, correlated positively with relative humidity, although the association was weak. Correlations with wind speed at ground level and over the first 1000 ft were weakly negative. The 30-minute average concentrations were associated negatively with mixing depth and positively with Air Pollution Potential; no correlation existed with rainfall. Insufficient data existed to test for the presence of a relationship between atmospheric stability and measured pollutant levels. Comparisons of the data were also made with local and overseas measurements.

32532 **APTIC NO. 54482**

Pedace, Eduardo A. and Eric B. Sansone

THE RELATIONSHIP BETWEEN SOILING INDEX AND SUSPENDED PARTICULATE MATTER CONCENTRATIONS. *J. Air Pollution Control Assoc., 22(5): 348-351, May 1972. 16 refs.*

Experimental relationships between the mass concentration of suspended particulate matter and the optical density of particulates collected on paper tape (soiling index) were determined for the atmospheric aerosol and for aerosols of optical properties in field and laboratory tests. Simultaneous samples were obtained on membrane filters (for gravimetric analysis) and on Whatman No. 4 paper tape (for optical evaluation). Sampling procedures were adopted which ensured that the efficiency of sampling was the same in both cases. Consistent relationships between mass concentrations of suspended particulate matter and optical density expressed in terms of percent transmittance or percent reflectance were found for dispersions of coal, limestone, fly ash, and a coal limestone mixture. For atmospheric aerosol samples collected on the roof of the Graduate School of Public Health, University of Pittsburgh, the relationship between mass concentration and percent transmittance or percent reflectance was linear over the range of values observed. The correlation coefficients were 0.93 (for concentration versus percent transmittance) and 0.89 (for concentration versus percent reflectance). (Author abstract)

32533 **APTIC NO. 54898**

Seki, Toshihiko and Koji Abe

INVESTIGATION OF AIR POLLUTION (NO. 7) -- THE CONCENTRATION OF SULFUR OXIDES IN THE AIR OF SENDAI CITY IN THE PAST THREE YEARS BY AN AUTOMATIC RECORDER. *(Taiki osen ni kansuru chosa kenkyu (No. 7) -- jido kirokukei ni your kako sannenkan no sendai shinai ni okeru taikichu iosankabutsu nodo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic Rep. Inst. Pub. Health, no. 3:117-133, March 1972.*

Sulfur oxides in the air of Sendai were automatically recorded in 1968, 1969, and 1970. The maximum concentration of SOx during this period was 0.210 ppm at the Sendai Station, and 0.16 ppm at the Sendai Institute. Both occurred at 8 am. The annual average value of SOx was 0.030 ppm for 1968, 0.034 ppm for 1969, and 0.032 ppm for 1970 in front of the Sendai Station. Measurements taken at the Sendai Institute were 0.024 ppm for 1968, 0.023 ppm for 1969, and 0.023 ppm for 1970. The average value classified by season was 0.046 in winter, 0.030 in the spring, 0.027 in autumn, and 0.024 in the summer at the Sendai Station. Seasonal averages at the Sendai Institute were 0.028 ppm in winter, 0.026 in the spring, 0.020 in the autumn, and 0.020 in the summer. The maximum concentrations classified by time were detected between 8 and 9 am, and 4 and 6 pm.

1970

32534 **APTIC NO. 54250**

Just, J., S. Maziarka, and H. Wyszynska

CARCINOGENIC HYDROCARBONS IN THE ATMOSPHERIC AIR OF TEN MAJOR CITIES OF POLAND. *(Weglowodory rakotworcze w powietrzu atmosferycznym 10 wybranych miast w Polsce). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4(18)):31-36, 1970. 2 refs. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 1969.)*

NTIS: TT 7055124/4

To examine the relationship between cancer and the presence of polynuclear aromatic hydrocarbons in the air, the concentration of these compounds in dust was examined in 10 major Polish cities, and then compared with the death rates attributed to cancer in the inhabitants. In each city during the years of 1965-1967, high-volume air samplers were used in conjunction with fiberglass filters to individually measure benzo(e)pyrene, benzo(a)pyrene, benzo(ghi)perylene, and pyrene. The highest concentrations of pollutants occurred in older, industrialized cities, and were relative to a rise in temperature. A correlation between the level of atmospheric air pollution with polynuclear aromatics and morbidity rates related to cancer of the respiratory system was established.

32535 **APTIC NO. 54252**

Wielogorska, H. and R. Hryniewicz

MEASUREMENTS OF THE NITROGEN DIXODE CONCENTRATION IN THE ATMOSPHERIC AIR IN THE BIELANY SUBURB OF WARSAW. *(Pomiary stezen dwutlenku azotu w powietrzu atmosfereryczym w Warszawie na Bielanach). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4(18)):58-62, 1970. 1 ref.*

NTIS: TT 70555124/4

Nitrogen dioxide concentrations in the air were measured twice daily for a period of 6 months in an area where no major air pollution sources are present. The mean values were 15.0 to 38.8 micrograms/cu m and were dependent upon wind direction and temperature. Higher concentrations were noted for months with larger insolation and a higher mean temperature.

ATMOSPHERIC INTERACTION

1973

32536 **APTIC NO. 54434**

California Univ., Livermore, Lawrence Livermore Lab.

FIRST ANNUAL REPORT, DOT-CIAP PROGRAM. *Atomic Energy Commission Contract W-7405-Eng-48, TID-4500, UC-53 Meteorology, UC-4 Chemistry, 233p., Feb. 13, 1973. 303 refs.*

NTIS: UCRL 51336

The effect on global climate of large numbers of aircraft operating in the stratosphere were studied by means of five numerical models in five projects, each of which focuses both on discrete subproblem and a contribution to the problem as a whole. Three of these models are based on the different scales of atmospheric motion and the other deal with stratospheric kinetics and radiation transport. The Dispersion and Transport Model consists of single-plume and flight corridor models which describe the wake concentration history in the transition region from the stabilized aircraft wake to the global scale. The Global Kinetics and Transport Model simulates vertical and latitudinal dispersion of stratospheric traces, using mean winds and eddy diffusion coefficients. The Zonal Atmospheric Model calculates mean zonal and meridional atmospheric motion, plus the thermal and hydrologic interactions of the air-ocean earth system. The Stratospheric Kinetics Model simulates the chemical and photochemical kinetics of the stratosphere. The Radiation Transport Model develops a spectral model incorporating absorption in the solar and long-wave bands with particulate scattering. The Meteorological Guidance Group does in-depth studies of atmospheric processes and phenomena to provide guidance for the modeling programs. This group also devises test situations for validation of completed models.

32537 **APTIC NO. 54403**

Ackerman, M., D. Frimout, C. Muller, D. Nevejans, J.-C. Fontanella, A. Girard, and N. Louisnard

STRATOSPHERIC NITRIC OXIDE FROM INFRARED SPECTRA. *Nature (London), 245(5422):205-206, Sept. 28, 1973. 15 refs.*

The first determination of the vertical distribution of the abundance of nitric oxide in the stratosphere is reported. The method used involved absorption spectrometry in the 5.2 micron band of NO using the setting sun as a light source. Recording of the solar spectrum from an altitude of 40 km started when the solar zenith angle was 86 deg; telluric absorptions became more and more proncunced for solar zenith angles larger than 90 deg. Absorption lines of NO, carbon dioxide, and water vapor were predominant. The amount of NO in the optical path was deduced from the integrated line absorption cross sections computed from the band intensity. The number density of NO against altitude was inferred from the total amounts measured by diversion of the atmosphere into successive layers, each 3 km thick. The NO number density in cu cm varied between 30,000,000-70,000,000 (altitude 37.5 km) and 10,000,000-30,000,000 (altitude 16.5 km). The NO mixing ratio by volume varied from 6.2 times 10 to the -9th power to 2.6 times 10 to the -9th power (altitude 37.5 km) and 10.2 times 10 to the -11th power to 3.2 times 10 to the -11th power (altitude 16.5 km). Similar results were obtained using a similar spectrometer on Concorde 001 in the same spectral region and with the same resolving power. These results indicate that a stratospheric source of NO must exist. The sum of the measured amounts of NO and NO2 indicates a large sink of nitrogen oxides below 25 km at mid-latitudes.

32538 **APTIC NO. 54378**

Angell, J. K. and J. Korshover

QUASI-BIENNIAL AND LONG-TERM FLUCTUATIONS IN TOTAL OZONE. *Monthly Weather Rev., 101(5):426-443, May 1973. 59 refs.*

Quasi-biennial and long term fluctuation in total ozone were estimated from stations with more than 4 years of records in north polar, tropical, south temperate, and south polar latitudes and more than 8 years of records in north temperate latitudes. The quasi-biennial total O3 fluctuations tended to be out of phase in tropical and extratropical latitudes, with the extratropical fluctuations better organized in the Southern than Northern Hemisphere. In the Tropics, the quasi-biennial total O3 and zonal wind oscillations were significantly in phase, but, in extratropical latitudes, the total O3 fluctuations were alternately in phase and out of phase with the tropical zonal wind oscillation, the out of phase relation being the dominant one. For the past 15-20 years there was an increase in total O3 of 3.9%/decade in the Northern Hemisphere, a decrease of 1.2%/decade in the Southern Hemisphere, and a world wide increase of 1.5%/decade. An increase in total O3 in north temperate latitudes seemed quite certain, the four regional areas all showing increases varying from 1.9%/decade in North America to 10.7%/decade in the Soviet Union. There was considerable evidence that total O3 maxima occur 1-3 years after sunspot maxima, with the relation most pronounced in the Southern Hemisphere, but there was little evidence of a reduction in total O3 due to nuclear testing (production of nitric oxide). Volcanic dust caused a possible decrease in ozone. (Author abstract modified)

32539 **APTIC NO. 54959**

Angell, J. K., W. H. Hoecker, C. R. Dickson, and D. H. Pack

URBAN INFLUENCE ON A STRONG DAYTIME AIR FLOW AS DETERMINED FROM TETROON FLIGHTS. *J. Appl. Meteorol., 22(6):924-936, Sept. 1973. 13 refs.*

The influence of an isolated urban area on the horizontal and vertical air velocity at heights near 400 m in relatively strong (13 m/sec) daytime flow was indicated by tetroon flights across Oklahoma City. The Lagrangian measurements were collated with fixed point measurements of horizontal and vertical velocity on a 460 m television tower. Above the city in the morning there is a mean trajectory turning toward lower pressure of 10 deg. This turning, presumably frictionally induced, is noted only weakly in the afternoon and not at all in the evening, but there is slight evidence for a bending of the trajectories around the city at these later times. During the day the city appears as the source of a plume of ascending air motion extending at least 30 km downwind of the city, with both tetroon and tower measurements indicating a mean upward velocity of almost 0.4 m/sec 10 km downwind of the city center at heights near 400 m. On the average the magnitude of the stress determined from the covariance of the eddy velocity components along the tetroon flights is about 70% of the magnitude measured on the tower, and there is a correlation of nearly 0.5 between individual measurements of stress by the two techniques. The magnitude of the tetroon stress is intimately related to building height and density, with stress values near 1 dyn/sq cm beyond the city outskirts. The fraction of the stress associated with Lagrangian oscillations of 1-10 min period (in comparison with 1-30 min period) increases from 20% upwind of the city to 80% downwind of the city in the daytime average. (Author abstract modified)

32540 **APTIC NO. 54412**

Baross, Jozsefne, Gezane Marton, Laszlo Mucskai, and Gabor Nyeste

COMPUTATION METHOD AND COMPUTER PROGRAM FOR THE EVALUATION OF CHEMICAL PLANT-GENERATED AIR POLLUTION DATA. *(Szamitasi modszer es gepi program vegyipari uzemek legszennyezesi adatainak ertekelesere). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):232-239, 1973. 3 refs.*

The principles and operation of a computer program, elaborated by the Hungarian Chemical Industries Engineering Center on the basis of the method and equations proposed by the American Society of Mechanical Engineers are presented. The method takes parameters such as wind speed and direction, wind speed and direction variations, corrected stack height, and stability conditions, into account. The method is suitable for the provision of pollutant concentrations in any given point provided the difference in the specific weight of the air and the pollutant is negligible. Three different computer programs were elaborated, one for the determination of the pollutant concentration due to a single source, another for that of the pollutant concentration in discrete points due to multiple emission sources in a square network, and a third the determination of the long-term, cumulative, average pollutant concentration in polar coordinates. Data sheets for the three different computer programs are presented.

32541 **APTIC NO. 54623**

Bary, E. de

THE INFLUENCE OF MULTIPLE SCATTERING ON THE SKY RADIANCE AS A FUNCTION OF WAVE LENGTH, ZENITH DISTANCE FROM THE SUN, TURBIDITY, ALBEDO, AND ABSORPTION BY AEROSOL. *Beitr. Physik Atmosphaere, 46(3):213-221, 1973. 3 refs.*

The dependence of the ratio of primary scattering on wavelength, angular distance from the sun, and turbidity is shown in a three dimensional presentation and discussed. The calculated results for a solar height Ho equals 24 deg are given for both solar horizontal and solar vertical, two albedos, and for the cases of a nonabsorbing and an absorbing atmosphere. The wavelength dependence is strongest at small turbidity and great scattering angle, and in these cases, the absolute value of the percentage ratios reaches its maximum in the case of a small albedo, especially in an absorbent atmosphere. In a nonabsorbent atmosphere, the ratios depend more on the angular distance from the sun than in an absorbent atmosphere.

The decrease in turbidity lessens the change of the percentage ratios as a function of the angular distance. The turbidity dependence of the percentage ratios PS:TS is small up to phi equals 70 deg. The surfaces of equal ratios of PS:TS almost parallel the T, lambda surface (surface of equal angular distance). The incident radiation is attenuated by absorption, and consequently, the primary scattering of a nonabsorbent atmosphere is always greater than that of an absorbent atmosphere with multiple scattering. In cases of equal phi, the percentage ratios PS:TS in the solar almucantar are always smaller than those in the sun s vertical. The resumed increase of the percentage ratio PS:TS in the range of backscattering in an absorbent atmosphere is not quite so well marked as in the solar almucantar. (Author abstract modified)

32542 **APTIC NO. 54521**

Bassett, I. M., R. G. L. Hewitt, and Brian Martin

DESIGN CRITERIA FOR FINITE-DIFFERENCE MODELS FOR EDDY DIFFUSION WITH WINDS THAT GUARANTEE STABILITY, MASS CONSERVATION, AND NONNEGATIVE MASSES. *Monthly Weather Rev., 101(6):529-534, June 1973. 6 refs.*

A technique for following the circulation of a tracer in a turbulent fluid is developed from the integral form of the mass continuity equation. Numerical methods based on this technique are stable to ensure that the total tracer mass is conserved, and the mass in any region is always nonnegative. As an illustration of the technique, a numerical method is developed for a two-dimensional eddy diffusion model of the stratosphere. (Author abstract modified)

32543 **APTIC NO. 54532**

Becker, Karl H.

THE PHYSIOCHEMICAL PROBLEMS OF AIR POLLUTION. *(A levegoszennyezes fizikai-kemiai problemai). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):219-228, 1973. 46 refs.*

Chemical properties of the principal air pollutants such as sulfur dioxide, carbon monoxide, hydrocarbons, nitrogen oxides, halogens, and lead, as well as the world-wide changes in the composition of atmospheric air are pointed out. Detailed description is given of the physical and chemical processes involved in photochemical smog formation. Sensibilization of the human organism to specific meteorological changes by aerosols was observed. Probable increase in the Aitken particles, carbon dioxide, and lead concentration, and changes in the atmospheric electricity were observed. The photooxidation of automotive exhaust hydrocarbons during the formation of Los Angeles type smog results in such polluting components as ozone, formaldehyde, acrolein, and peroxyacyl nitrate. The photooxidation of the hydrocarbons is catalyzed by nitrogen oxides, especially nitrogen dioxide, and ozone. Headache, dyspnea, and eye irritation are among the common effects of photochemical smog.

32544 **APTIC NO. 54876**

Bergstrom, Robert W.

COMMENTS ON THE ESTIMATION OF AEROSOL ABSORPTION COEFFICIENTS IN THE ATMOSPHERE. *Beitr. Physik Atmosphaere, 46(3):198-202, 1973. 23 refs.*

Three interpretations of Fischer s measurements are given to show the extreme difficulty of determining aerosol absorption coefficients. Fisher measures the transmission and scattered radiation from a layer of collected aerosol. He then computes the absorption index using an equation which is valid for a plane wave in a medium with uniform optical properties. The three different ways of interpreting the same measurement are: to assume a bulk mean imaginary index of refraction, which is applicable to all particles; to assume that a small percentage of particles are absorbing with a proportionally higher imaginary index of refraction; to assume that the absorption coefficients in the layer are identical to those if the particles were in the atmosphere. All three interpretations lead to absorption coefficients which vary almost by an order of magnitude. It should be possible to determine a mean absorption coefficient and a corresponding mean imaginary part of the refractive index for absorption. In order to do this it appears necessary to measure the spectral solar flux in the atmosphere accurately enough so that the divergence can be computed and to simultaneously measure the aerosol concentration, size distribution, composition, and bulk absorption properties. Simultaneous measurements of this type have recently been attempted in the Caenex program.

32545 **APTIC NO. 54960**

Bergstrom, R. W., Jr. and R. Viskanta

MODELING OF THE EFFECTS OF GASEOUS AND PARTICULATE POLLUTANTS IN THE URBAN ATMOSPHERE. PART I: THERMAL STRUCTURE. *J. Appl. Meteorol., 12(6):901-912, Sept. 1973. 33 refs.*

The short term effects of radiatively participating pollutants upon the temperature distribution in the boundary layer of the urban atmosphere is predicted. A mathematical model was constructed for atmospheric radiation transfer and one dimensional mass, momentum, and energy transport in the planetary boundary layer. The atmosphere, consisting of gaseous and particulate pollutants as well as natural constituents, is considered to absorb, emit, and scatter aniosotropically radiant energy. A series of numerical simulations of the thermal structure in the urban atmosphere is performed for summer and winter conditions, with and without an elevated inversion. The numerical simulations showed that the aerosol pollutants reduced the solar radiant flux at the surface which in turn lowered its temperature during the day. The additional solar heating due to the pollutants caused the atmosphere to be slightly warmer at higher altitudes. The surface temperatures during the day were slightly higher for nonabsorbing aerosols than for aerosols with some absorption. Under the conditions investigated, the largest surface temperature reduction was 2 C, and the maximum rise of the atmospheric temperature due to the additional solar heating was about 1 C after a 2-day period. The gaseous pollutants increased the downward thermal radiation flux and raised the surface temperature at night. The maximum predicted surface temperature increase was about 3 C after a 2-day simulation. The pollutant gases enhanced the net radiative cooling below a stable region. This additional cooling modified both the nighttime stable layer and the elevated inversion by causing an upward motion of the stable regions. (Author abstract modified)

32546 **APTIC NO. 55272**

Bergstrom, R. W., Jr. and R. Viskanta

MODELING OF THE EFFECTS OF GASEOUS AND PARTICULATE POLLUTANTS IN THE URBAN ATMOSPHERE. PART II: POLLUTANT DISPERSION. *J. Appl. Meteorol., 12(6):913-918, Sept. 1973. 8 refs.*

The effect of the radiative participation of the pollutants on their own dispersion was predicted by a numerical solution of the equations of a transient, one dimensional transport model. The particulates affected the pollutant concentration in the planetary boundary layer only slightly by reducing the instability of the atmosphere during the day and thus increasing the surface concentration. This reduction in turbulence also hindered the breakup of an elevated stable layer thereby leading to increase in the pollutant concentration. Absorption and emission of thermal radiation by pollutants raised the nocturnal surface temperature by increasing the downward thermal radiation flux. The warmer surface temperature decreased the stability during the night causing lower maximum pollutant concentrations. This decrease was as large as 40%. The increased infrared cooling due to pollutants beneath an elevated stable region caused an upward motion of the region and greatly reduced the concentrations. The utility as well as the limitations of the one dimensional transport model for gaining improved understanding to the thermal structure and pollutant dispersion in the planetary boundary layer was demonstrated.

32547 **APTIC NO. 54462**

Bida, M. P.

STUDY OF ATMOSPHERIC AIR POLLUTED WITH EMISSIONS FROM A GAS PROCESSING PLANT. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 19-21, APTD-1366. Translated from Russian. (Also: Zdorovya, 1970:170- 173, 1970.)*

NTIS: PB 214264

The air reservoir around a gas producing plant was studied to see if various organic substances could escape into the air. Thirty samples of air collected at distances 100 to 5000 m from the plant were measured by chromathermography. Temperature of atmospheric air, barometric pressure, humidity, plus direction and velocity of wind were considered. Within a radius of 250 m from the plant, the average concentration was 65.4 mg/cu m for propane, 38.4 mg/cu m for butane, and 28.4 mg/cu m for pentane. Methane, ehtane, hexane and heptane were also measured. Distance from the plant decreased the hydrocarbon content of the air, but at a distance of 1000-5000 m the pollution level remains significant. Concentration of hydrocarbons in atmospheric air is dependent on meteorological factors, and during the winter-fall period, the concentration is considerably higher. Thus, the gas processing plant pollutes the atmospheric air with a mixture of saturated hydrocarbons which are influenced by the temperature and velocity of atmospheric air.

32548 **APTIC NO. 54768**

Bressan, D. J., R. E. Larson, and P. E. Wilkniss

ATMOSPHERIC RADON AND DUST, AIR MASS TRAJECTORIES AND METEOROLOGICAL CONDITIONS OVER THE GREENLAND SEA. *Nature Phys. Sci., 245(144):74-77, Oct. 1, 1973. 4 refs.*

In Aug. 1971, radon-222 and continental dust were measured over the Norwegian and Greenland seas. These shipboard measurements were compared with air mass trajectories obtained from synoptic weather charts. The measurements were continued 1 year later. A radon pulse over the ocean indicates a changing air mass and the possibility of the occurrence of continental dust, with the shape of the pulse suggesting the amount of dust. There is no guarantee of increased dust concentration with radon pulses because rainout, washout, and fog can remove dust without removing radon from the air mass. No significant dust concentrations have been observed at sea, however, without significant radon peaks. The implied usefulness of pulse analysis emphasize the necessity for close spaced (approaching continuous) sampling and equally rapid analysis. As well as making contributions to the understanding of transport and mixing, real time chemical indicators would also be useful for more discrete air mass characterization. Also, a method of making quantitative atmospheric dust measurements on an hourly basis would be a significant contribution.

32549 **APTIC NO. 54852**

Calder, Kenneth L.

ON ESTIMATING AIR POLLUTION CONCENTRATIONS FROM A HIGHWAY IN AN OBLIQUE WIND. *Atmos. Environ., 7(9):863-868, 1973. 2 refs.*

A mathematical model of air quality based on calculation of atmospheric diffusion is given. Concentrations produced by an extended near-ground line-source of vehicularly-generated highway air pollution are considered with special emphasis on the influence of the obliquity of the wind. Over a wide range of wind directions the concentration distribution can be calculated by a simple approximate formula. Although the concentrations increase as the wind more closely parallels the direction of the highway, the increase is only slight and, for many practical purposes, could be disregarded. Plume behavior is calculated. (Author abstract)

32550 **APTIC NO. 54334**

Carter, John W., Jr. and Robert Y. Nelson

AN URBAN AIR POLLUTION PREDICTION MODEL BASED ON DEMOGRAPHIC PARAMETERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1973. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-255.)*

Statistical correlations between the regression of demographic and emissions data were used to construct a model to predict future air pollution emissions, concentrations, and costs-to-control based upon demographic data inputs from a population model. Correlations were run for 23 cities ranging in population from 100,000 to 2 million. There correlations are between total pollutant emissions and the demographic factors of population, number of passenger vehicles registered per county, and the percent of the work force employed in manufacturing. Land area is used to utilize the emissions on a ton/sq mi/yr basis. Using these correlations to describe cities of increasing size and age, a linear modeling technique is used to describe the future air pollution emissions in a growing city either on a geographical or a population-industrial growth pattern. Since the probability that the emissions of a growing city will fall precisely on the regression line is low, the model provides that measured emission values may be substituted to establish a more representative regression for that city. Reductions in emissions from mobile sources as a result of the requirements of the Air Quality Act of 1967 for the manufacture of reduced-pollution auto engines by 1975-1976 are predicted by a step-function. Future concentrations of air pollutants are preducted through the use of meteorological retention factors developed by George C. Holzworth. The emissions in excess of the ambient air quality standards are also predicted, and the total cost-to-abate these excesses are calculated. The model is validated against the measured emissions and concentrations of nine cities. (Author abstract modified)

32551 **APTIC NO. 54248**

Chavaudra, Jean and Raymond Latarjet

THE INFLUENCE OF THE VARIATIONS OF THE ATMOSPHERIC OZONE CONTENT ON SOME BIOLOGICAL EFFECTS OF THE SOLAR ULTRAVIOLET RADIATION. *(Influence des variations de l ozone atmospherique sur certaines activites biologiques du rayonnement ultraviolet solaire). Text in French. C.R. Acad. Sci. Paris, Ser. D, 276(26):3481-3485, June 1973. 12 refs.*

The quantitative variations of the atmospheric ozone content have noticeable influence on the spectral distribution and the flux of the solar ultraviolet radiation reaching the surface of the earth, and thence also on the biological effects, namely the abiotic and mutagenic, as well as the erythemal and carcinogenic effects provoked by such UV radiation. Relations between the reduced thickness of the ozone layer with a range of 1 to 10 mm, and the activity of the UV radiation regarding its abiotic, mutagenic, carcinogenic, and erythemal effects were established by calculations. The influence of ozone layer thickness was weak for wavelengths exceeding 310 nanom. A reduction by 5% in the ozone quantity entrains an increase of about 10% in the intensity of the abiotic, mutagenic, erythemal, and carcinogenic effects of the UV radiation.

32552 **APTIC NO. 54527**

Chester, R. and J. H. Stoner

PB IN PARTICULATES FROM THE LOWER ATMOSPHERE OF THE EASTERN ATLANTIC. *Nature (London), 245(5419):27-28, Sept. 1973. 8 refs.*

The concentration of lead in atmospheric particulates collected along the length of the Atlantic Ocean from a variety of air masses is discussed. There is a marked decrease in the Pb contents of the particulates southwards from the westerlies to the Inter-Tropical Convergence Zone (ITCZ) in the northern hemisphere, and a decrease from the variable winds of the South African coast to the ITCZ in the southern hemisphere. This profile offers evidence of anthropogenic effects on the Pb concentrations of partiuclates from oceanic regions. The effects are geographically dependent, the highest Pb concentrations being found in particulates originating from relatively heavily populated source areas such as Western Europe, which can supply solids to the westerlies in this region of the North Atlantic and South Africa.

32553 **APTIC NO. 54641**

Daniels, Anders

MODELING OF CARBON MONOXIDE CONCENTRATIONS FROM MOVING HIGHWAY TRAFFIC. *Staub, Reinhaltung Luft, 33(9):342-344, Sept. 1973. 11 refs.*

The National Environmental Policy Act requires an environmental impact statement for any Federally funded highway project. It is important to develop diffusion models that can realistically predict the air pollution impact of such highways. Common models are discussed, such as the Gaussian single and multiple line source models for grade level roadways and the grid models for elevated and depressed highways. To allow for the moving traffic, the Gaussian diffusion model was modified, evaluating the standard deviations at modified downwind distances. For carbon monoxide concentrations for a proposed highway on Oahu, the Federal primary and secondary 1-hour air quality standards of 40 mg/cu m are predicted to be exceeded at least up to 1000 ft downwind of the highway, and the Hawaii air quality standards of 10 mg/cu m will be exceeded even as far as 5000 ft downwind of the proposed highway. (Author abstract modified)

32554 **APTIC NO. 54599**

Danilov, A. D.

MODERN AERONOMY PROBLEMS. *(Sovremennyye problemy aeronomii). Text in Russian. Vestn. Akad. Nauk SSSR, no. 7:45-51, 1973.*

Dynamic and photochemical processes are reviewed. Two basic types of positive ions, molecular oxygen and nitric oxide, were found in the 100-130 km layer of the ionosphere. Atomic oxygen first appears at altitudes of 130-140 km, and shows strongly increasing concentration with altitude. Nearly equal concentrations of atomic oxygen, molecular oxygen, and nitric oxide ions at 180-200 km altitude were observed. The ionosphere had more pronounced molecular character during night as compared to daytime. The molecular ions practically fail to react on changes in the solar radiation activity. Daytime increase in the atomic oxygen:molecula nitrogen ratio was observed. Molecular oxygen, molecular nitrogen, and atomic oxygen ions were the primary products of ionization. The latter two are converted into molecular oxygen and nitric oxide ions by ion-molecular reactions. Computer programs for modeling photochemical reactions occurring in the atmosphere were set up. A relatively thin layer of meteoric ions, containing magnesium, iron, calcium, sodium, and silicon, was found. The formation of meteoric ions was due to the formation of a so-called sporadic E layer; a thin layer of ionization in which common ionospheric ions are absent.

32555 **APTIC NO. 54868**

Davis, Briant L., L. Ronald Johnson, and F. John Moeng

PARTICLE SIZES OF CLOUD SEEDING AEROSOLS OBTAINED BY WIDE-ANGLE AND SMALL-ANGLE X-RAY SCATTERING. *Norelco Rep., 20(2):15-20, 1973. 25 refs.*

The utility and advantages of making cloud seeding aerosol particle analyses by both wide angle (Fourier-profile) and small angle X-ray scattering techniques available in a modern X-ray diffraction laboratory are presented. Known particle diameter information available from electron microscopy are generally equivalent to those obtained by several analyses of silver iodide aerosols using the Fourier deconvolution technique but are smaller than those obtained by small-angle scattering techniques (Porod surface area technique and Jellinek distribution analysis) by factors of from two to 10. An estimate of the diameter of the particle or the range of inhomogeneity, more properly obtained by the Porod method, eliminates multiple scattering and other experimental difficulties by the use of the tails of the scattering curves. The systems using the Fourier deconvolution technique all produce relatively uniform particle size (within the range of sizes observed with the aerosols) regardless of the type of solution and the manner of combustion. The scattering of X-rays at small angles is independent of crystallite size and dependent only upon the aggregate particle size and pore space distribution; hence, small angle results would be expected to yield larger numbers for the laboratory filter paper collection technique where considerable coagulation occurs. An important result of the study is that both crystallite and aggregate particle size can be observed for silver iodide generator effluent by X-ray diffraction methods. These data amply demonstrate the value of both wide and small angle X-ray scattering to the area of aerosol physics and artificial ice nuclei delivery systems.

32556 **APTIC NO. 54595**

Deryagin, B. V.

RESEARCH OF AEROSOL DYNAMICS. *(Izucheniye dinamiki aerozoley). Text in Russian. Vestn. Akad. Nauk SSSR, no. 7:38-44, 1973.*

Recent research and studies in aerosol dynamics are surveyed. The studies made recently are mainly concerned with the dynamics of cloud and fog formation, cloud seeding, fog prevention, and mechanisms involved in the capture and release from surfaces of aerosol particles. An aerosol chamber permitting constant supersaturation in both space and time to be maintained was developed. This chamber is also suitable for the recording of ionizing particles. Highly dispersed cetyl alcohol or other higher alcohols were suitable for the dispersion of fog when used in the early stage of fog formation, and for the stabilization of fog when used for fogs already formed. The capture of aerosol particles is facilitated by the condensation on them of water vapor. A study of thermophoretic and diffusiophoretic processes involved in cloud formation revealed the high capture efficiency of cloud droplets for aerosol particles, which is the basis of the self-purifying ability of the atmosphere. Periodical vertical motion of the cloud droplets, with alternating condensation and evaporation processes, was observed.

32557 **APTIC NO. 54953**

Dianov-Klokov, V. I. and I. P. Malkov

ON THE ATMOSPHERE ABSORPTION BY COMPLEXES (N2--N2) AND (N2--O2) NEAR 4.3 MICRON. *(O pogloshchenii kompleksami (N2--N2) i (N2--O2) okolo 4,3 mkm v zyemnoy atmosfere). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 9(7):729-736, 1973. 10 refs.*

Absorption features of (nitrogen--nitrogen), (nitrogen--oxygen) short-lived complexes in the region of N2 molecule fundamental vibration band 2330/cm were investigated. Gaseous N2--O2 mixture absorption spectra were obtained at T equals 293 K and pressures up to 20 bars, the total path length of the multitraversal cell was 100 m. Combining the known spectroscopic data for water, carbon dioxide, and nitrous oxide molecules with obtained parameters for complexes the synthetic spectrum of terrestrial atmosphere at 2400-2700/cm region was calculated. The results of direct measurements of the atmospheric transmission of sun radiation agreed very well with calculations, confirming the essential role of N2 complexes in the absorption of light near 4.3 micron. (Author abstract)

32558 **APTIC NO. 55295**

Fitzjarrald, D. E.

A FIELD INVESTIGATION OF DUST DEVILS. *J. Appl. Meteorol., 12(5):808-813, Aug. 1973. 9 refs.*

The interaction between dust devils and their environment was investigated in a field observation program conducted at El Mirage, California. The outputs of sensors designed to measure vertical vorticity were recorded, together with those of cup anemometers. Analysis of the data indicated that there is no correlation between vorticity measured at a point and the direction of rotation of nearby dust devels. Tangential velocity, vertical velocity, and temperature were determined in 11 dust devils. Maximum vertical velocities were about one-tenth of the tangential velocities, indicating that the boundary layer height extended well above the 2 m measurement height. The data are thus unlikely to reveal a cooler area at the very center of the vortex due to downward motion. (Author abstract modified)

32559 **APTIC NO. 54466**

Gildenskiold, R. S. and B. V. Rikhter

SANITARY EVALUATION OF AN EFFECTIVE METHOD OF CALCULATING THE DISPOSAL OF EMISSIONS FROM A STATE REGIONAL ELECTRIC POWER PLANT (SREPP). *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 40-46, APTD-1366. Translated from Russian. (Also: Uchenye Zapiski, 1968:16-23, 1968.)*

NTIS: PB 214264

The intensity and propagation of pollutants in the atmospheric air were investigated during different seasons around three thermal electric power plants. State Regional Electric Power Plant-1 (SREPP-1) was studied during the fall, SREPP-2 in the winter, and SREPP-3 in the summer. For SREPP-1, samples of fly ash and sulfur dioxide were collected within a 15 km radius of the source. The data of the study were compared with the results of the theoretical determination of the distribution of concentrations according to zones. Graphs show the calculated concentrations of SO2 and dust according to zones, the statistically significant maximum single, and the frequently occurring maximum concentrations. With the use of this temporary method, as opposed to Andreyev s formula, the averaged maxima do not exceed the level of the calculated gas pollutions of the ground layer of the atmosphere when it is calculated for the worst conditions of SREPP-1 operation. For SREPP-2, the largest excess over the maximum permissible concentrations (MPC) for SO2 was 2.6 times, and was observed in the 3 km zone. In the SREPP-3 zones of largest concentration, the average maximum values were approximately 0.1 mg/cu m. These data validate the use of the temporary method for the prognostication of the probable maximum gas and dust content of the atmospheric air around populated areas due to discharges from newly planned or modernized thermal electric power plants.

32560 **APTIC NO. 54972**

Goff, Gordon D., J. Clifton Spendlove, A. Paul Adams, and Paul S. Nicholes

EMISSION OF MICROBIAL AEROSOLS FROM SEWAGE TREATMENT PLANTS THAT USE TRICKLING FILTERS. *Health Serv. Repts., 88(7):640-652, Aug.-Sept. 1973. 8 refs.*

The extent to which microbial aerosols are emitted and travel downwind from trickling filter sewage treatment plants depends upon a number of factors relating to the volume of sewage processed and various environmental conditions. Solar radiation significantly reduces viable aerosol emission, as does low relative humidity (RH) and low windspeed. Conversely, the coliform aerosol count increases with an increase in RH. Windspeeds between 6 and 10 mi/hr favor emission of microbial aerosols as compared with windspeeds above and below this range. E. Coli may be used as an indication of the air pollution from sewage plants and other fecal sources. (Author conclusions modified)

32561 **APTIC NO. 54760**

Goldsmith, P., A. F. Tuck, J. S. Foot, E. L. Simmons, and R. L. Newson

NITROGEN OXIDES, NUCLEAR WEAPON TESTING, CONCORDE AND STRATOSPHERIC OZONE. *Nature (London), 244(5418):545-551, Aug. 1973. 34 refs.*

The production of nitrogen oxides in the shock waves of explosions associated with the testing of nuclear weapons in the atmosphere was calculated. This allowed the total injection of NOx into the stratosphere to be deduced for each year in which nuclear tests have taken place. These amounts were compared with those expected from the engine exhaust products of fleets of Concordes flying in the stratosphere for more than 10 hr/day. Nuclear explosions have been equivalent, as far as nitrogen oxide stratospheric injections are concerned, to large numbers of fully operational Concordes. For example, during the years of maximum nuclear activity (1961 and 1962), the number of Concordes giving equivalent NOx emissions would have been about 600 and 1000, respectively. Analysis of the ozone records revealed no detectable changes in the total atmospheric ozone during and after the periods of nuclear weapon testing. Although the two modes of NOx injection may not be identical from a meteorological point of view, it appears that massive injections of NOx into the stratosphere do not upset the O3 layer.

32562 **APTIC NO. 54643**

Granat, Lennart and Henning Rodhe

A STUDY OF FALLOUT BY PRECIPITATION AROUND AN OIL-FIRED POWER PLANT. *Atmos. Environ., 7(8):781-792, Aug. 1973. 13 refs.*

The distribution of pollution deposition by precipitation around an oil-fired power plant on the west coast of Sweden was investigated. The measurements cover seven precipitation events from Nov. 10 through Dec. 15, 1971. The samples were analyzed for sulfur, pH, alkalinity, and sodium. In most precipitation events an additional deposition (above the regional background level) of S and acid was identified on the leeward side of the source. Compared with the background values, the observed increase was generally less than about 100%. As a long term average, the additional deposition of acid by precipitation, due to the power plant, was estimated to be not larger than 10-15% within 15 km of the plant. A comparison with emitted quantities showed that 1-6% of the S emitted during the precipitation was deposited within the first 15 km, corresponding to a travel time of 20-60 min. If the comparison is made using the total emission, including the dry periods, the fraction is only a few per mile. (Author abstract modified)

32563 **APTIC NO. 54517**

Hall, Franklin P., Jr., Claude E. Duchon, Lawrence G. Lee, and Richard R. Hagan

LONG-RANGE TRANSPORT OF AIR POLLUTION: A CASE STUDY, AUGUST 1970. *Monthly Weather Rev., 101(5):400-411, May 1973. 11 refs.*

An air pollution episode during August 1970 over parts of seven States in the upper midwest and the Great Plains (impact area) is examined. Trajectory analysis utilizing 850 mb winds showed that the air mass containing smoke and haze originated over the central midwest (source region) and travelled as much as 700 mi to the impact area. A large, nearly stationary high pressure system over the source region allowed the pollution to accumulate beneath a midlevel subsidence inversion located generally near 700 mb. Southeasterly flow around the backside of the high pressure system and the northeasterly flow around a weak low to the south advected the pollution into the impact area. At times, surface visibilities in parts of the impact area were restricted by haze to as little as 4 mi. Although particulate count data were meager, several stations recorded their highest particulate count of the year during the episode. (Author abstract modified)

32564 **APTIC NO. 54926**

Hamilton, P. M. and D. J. Moore

GAS TURBINE PLUME HEIGHTS MEASURED AT NORWICH POWER STATION-- PRELIMINARY ANALYSIS. *Atmos. Environ., 7(10):991-996, 1973. 5 refs.*

Lidar measurements of the trajectories of the Norwich gas turbine exhaust plume were made at distances of up to 1500 m downwind of the stack. The usual method of observation was to aim the lidar in such a direction that the plume was intersected at around 1 km from the stack top. The height and range of the echo from the plume material, which presumably consisted of small droplets of unburned or partly burned fuel, possibly with some additional sulfuric acid aerosol, were displayed on the lidar oscilloscope using a brightness modulated technique. The laser was fired at 1 sec intervals and the elevation was changed by half a degree between each laser shot. From time to time the stack top was included on a photograph to check range and height accuracy. The expression z equals 540 Q to the 1/4th power/U gave a good estimate of the plume rises at 1000 and 12500 m downwind, the mean values of zU/Q to the 1/4th power at the two distances are 522 and 539 sq m/sec MW to the -14th power respectively. (Author abstract modified)

32565 **APTIC NO. 54645**

Hanna, Steven R.

A SIMPLE DISPERSION MODEL FOR THE ANALYSIS OF CHEMICALLY REACTIVE POLLUTANTS. *Atmos. Environ., 7(8):803-817, Aug. 1973. 12 refs.*

Chemically reactive pollutants were analyzed by the simple ATDL dispersion model in which the surface concentration is proportional to area source strength divided by wind speed. The concentration predicted by the simple ATDL model can be used as a scaling parameter to put the governing equations into the dimensionless form. The resulting set of differential equations for the time rate of change of concentration in a region contains a few dimensionless governing parameters per equation. By analyzing the governing parameters, the relative importance of chemical and meteorological variables and source strengths can be assessed. The wind speed and source strength are the major factors determining the seriousness of the pollution problem in any region. Using a simple kinetic mechanism for photochemical smog as an example of the application of the model, it was shown that the model is capable of simulating observed noon time concentrations of nitrogen oxide, nitrogen dioxide, and relative humidity averaged over the Los Angeles basin on Sept. 29, 1969. The predicted hourly concentrations of NO, NO2, and relative humidity averaged over the Los Angeles Basin on Sept. 30, 1969 are as well correlated with observed concentrations as the predictions of the more complex PICK model developed by Sklarew. (Author abstract modified)

32566 **APTIC NO. 54647**

Henley, David C. and Glenn B. Hoidale

ATTENUATION AND DISPERSION OF ACOUSTIC ENERGY BY ATMOSPHERIC DUST. *J. Acoust. Soc. Amer., 54(2):437-445, Aug. 1973. 31 refs.*

The acoustic effects of atmospheric dust were investigated. Insight into its role in the attenuation and dispersion of acoustic energy in the lower troposphere was determined by a comparison of theoretical attenuation coefficients and dispersion functions in the 10 to the 0 power to 10 to the 7th power Hz range for the mechanisms of classical rotational absorption, molecular absorption, turbulent scattering, and dust absorption for a variety of dust and meteorological conditions. Over most of this frequency range the attenuation due to dust absorption is masked by one or more of the other attenuating mechanisms, but at lower frequencies there appear to be physically realizable dust and meteorological conditions wherein dust absorption may become significant. The most significant effect of atmospheric dust upon acoustic energy propagation is its dispersion, which is opposite in sign and much larger at lower frequencies than dispersion due to classical and molecular effects. The magnitudes of absorption coefficients and dispersion functions for dust are directly proportional to the particle concentration, and their frequency dependence varies with the particle size distribution. (Author abstract modified)

32567 **APTIC NO. 55296**

Joseph, Joachim H., Alexander Manes, and Dov Ashbel

DESERT AEROSOLS TRANSPORTED BY KHAMSINIC DEPRESSIONS AND THEIR CLIMATIC EFFECTS. *J. Appl. Meteorol., 12(5):792-797, Aug. 1973. 30 refs. (Presented at the International Weather Modification Conf., Canberra, Australia, Sept. 6-11, 1971.)*

The mass of natural aerosol injected into the atmosphere by desert wind systems of the Khamsinic type was estimated from long series of normal-incidence spectral solar radiation measurements, taken in Jerusalem and at Lydda Airport, and from synoptic analysis of the temporal and areal extent of such phenomenon. Assuming that the size distribution of desert aerosols peaks between 1-10 micron, the yearly global dust input to the atmosphere due to deserts is at least 128 plus or minus 64 million metric tons. The input from Mediterranean dust sources is 3.2 plus or minus 1.6 tons/yr. If desert dust has a refractive index of 1.5, the global albedo would be increased by 0.0002. This could decrease global average surface temperature by 0.7 K.

32568 **APTIC NO. 54471**

Karpeko, M. I.

IONIZATION OF ATMOSPHERIC AIR OF THE TOWN OF CHERVONOGRAD AND ITS SANITARY IMPORTANCE. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 69-71, APTD- 1366. Translated from Russian. (Also: Zdorovya, 1970:173-176, 1970.)*

NTIS: PB 214264

Ionization of atmospheric air in a town was measured in connection with pollution by emissions from boiler houses, mine pile-like waste dumps, and apartment furnaces. These data were compared with ionization at the outskirts of town where there were no industrial or domestic enterprises to pollute the air. These data were also studied in conjunction with meteorological factors. Heavy ions were prevalent in the town compared with a preponderance of light ions at the outskirts, indicating a high level of pollution at the industrial center. This decrease in light ions in the air of the town is dependent upon dust and smoke pollution and on an inadequate amount of greenery. The small height of the boiler stacks and the lack of gas and ash removal are responsible for smoke discharge pollution. During the furnace season, domestic heating is responsible for high dust content in the air. The ionization was compared to the temperature, humidity, and barometric pressure of the atmospheric air. A drop in temperature led to a decrease in ions; an increase in humidity also produced a decrease in ions; a decrease in pressure increased the ion concentration. Wind velocity at slight forces did not affect the ion concentration.

32569 **APTIC NO. 54470**

Khrigian, A. Kh.

OZONE CONCENTRATIONS IN THE LOWER STRATOSPHERE HARMFUL TO MAN. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 62-68, APTD-1366. Translated from Russian. (Also: Meteorol. i Gidrol., 1969:10-15, April 1969.)*

NTIS: PB 214264

The effects of ozone in the stratosphere were studied in relation to air passengers, crew, and aeronautical materials. Conditions existing when the ratio of the mixture (concentration by weight) reacted the value r1 equals 1 times 10 to the minus 6th power in the stratosphere, which corresponds to a concentration by volume equal to 1.66 which is the lower limit of harmful effects of ozone are examined. The photochemical theory of atmospheric ozone states that the ozone concentration is insignificant in the troposphere, then increases in the stratosphere to altitudes of 30-35 km, and above that decreases again. Statistical data of observations on the vertical distribution of ozone in the lower stratosphere made by ozone probes, were analyzed. In the lower stratosphere (up to 16-17 km), the probability of dangerous and even merely perceptible concentrations in the belt from 0 to 40 deg latitude is nil, and increases only at higher latitudes in the winter and spring. At that time, they must be taken into consideration when flights are made. Flights at higher levels will encounter a larger ozone content at all latitudes.

32570 **APTIC NO. 54340**

Kitagawa, Tetsuzo

EXHAUST GAS OF AIRCRAFTS AS A POSSIBLE ORIGIN OF PHOTOCHEMICAL SMOG (2). *(Kokagaku sumoggu no sasseigen to shite no hikoki haigasu no kanosei (2)). Text in Japanese. Anzen Kogaku (J. Japan. Soc. Safety Eng.), 12(4):261-273, Aug. 1973. 20 refs.*

The distribution pattern of the communities on the Kanto Plain which have suffered from the effects of photochemical smog indicates that the offending pollutants are transported by sea breezes from the Tokyo and Sagami Bays. The pollutants themselves, which accumulate in the temperature inversion layer above the bay areas, arise within the exhaust emission gases of aircraft. The fact that the ozone concentrations increase with the altitude, and that the high ozone concentrations are found in the atmosphere over these Bays, indicate that the pollutants originate in the sky, not on the earth. This theory provides for the explanation of many facts which are unexplainable according to the traditional assumption that the photochemical pollutants arise within the exhaust gases of automobiles and factories.

32571 **APTIC NO. 54970**

Liu, Hsien Ta and Susumu Karaki

STUDIES OF PARTICULATE PLUME DIFFUSION OVER LABORATORY WIND- GENERATED WATER WAVES. *Atmos. Environ., 7(9):869-890, 1973. 28 refs.*

A numerical simulation of the turbulent mass diffusion process from an elevated, continuous point source over a wind-disturbed water surface is described. The diffusion equation, with models for turbulent diffusivities, in the boundary layer over water waves was solved with a successive-over-relaxation finite difference scheme. In the numerical computation, measured quantities of flow conditions such as mean velocities, turbulent intensities, and boundary layer thickness were used. To improve computational efficiency, a variable grid system was used. The grid system was designed to expand with the spread of the diffusing plume. The water surface was viewed, in the mean as a flat surface with influences of the wavy surface implicitly incorporated into the turbulent diffusivities. The diffusivities are functions of the turbulent intensities, the boundary layer thickness, and the scale of the phenomenon. The numerical solutions were compared with experimental results of particle concentration measurements obtained with an optical system in a wind-water tunnel. With the net mean convection properly corrected for the effects of the particle fall velocity, streamline displacements in a developing boundary layer, and secondary flow (in the experimental facility), general agreements were observed between numerical solutions and corresponding experimental results. (Author abstract)

32572 **APTIC NO. 55278**

Lopez, Alain, Jean Servant, and Jacque Fontan

VARIATIONS IN THE CONCENTRATIONS AND PHYSICAL PROPERTIES OF AITKIN NUCLEI IN A NON-POLLUTED AREA. *(Variation des concentrations et caracteristiques physiques des noyaux d aitken dans un site non pollue). Text in French. Atmos. Environ., 7(10):945-965, 1973. 33 refs.*

The concentrations of Aitken nuclei were measured in a rural area of the Southwest of France from April to June 1971. The variations of these concentrations are related to the meteorological parameters, in particular to the stability of the lower atmosphere. The existence of a nocturnal source and a diurnal source is shown. The intensities of the sources are calculated. During the day photolytic reactions are taking place and the formation of the Aitken nuclei is increasing 5000 particles/sq cm/sec to 50,000 particles/sq cm/sec. The vertical stability of the lower atmosphere is also an important parameter to explain the variations of the concentrations. The mean radius of the particles is equal to 3.2 + or 0.6 times 10 to the -6th power cm. (Author abstract modified)

32573 **APTIC NO. 54396**

Lyons, Walter A. and Lars E. Olsson

DETAILED MESOMETEOROLOGICAL STUDIES OF AIR POLLUTION DISPERSION IN THE CHICAGO LAKE BREEZE. *Monthly Weather Rev., 101(5): 387-403, May 1973. 20 refs.*

The effects of lake breezes on mesoscale air pollution patterns in the urbanized shoreline areas of Chicago, Ill. were investigated. On the two late summer days studied, the lake breezes were extremely well developed. In flow depths ranged from 500 to 100 m, peak inflow velocities were 6-7 m/sec. Beginning at the shoreline between 0800 and 0900 LST, the breezes penetrated inland over 40 km. Clearly defined return flow layers were present at both days. Eulerian wind filed measurements from serial pilot balloon releases were used to make cross sections of the wind component. Convergence values in a narrow (1-2 km) zone at the lake breeze front exceeded 200 times 10 to the -5 power/sec, and calculated upward motions reached 125 cm/sec. Optically tracked tetroons yielded Lagrangian trajectory data that confirmed the basic pattern. Most importantly, the tetroons recirculated within the lake breeze cell, describing a helical trajectory roughly centered on the shoreline. The smaller suspended particulates (0.5-3.0 micron), which essentially float with the air, clearly suggest that a significant fraction of the pollutants released from nearshore sources move inland within the inflow, rise aloft at the front, advect lakeward in the return flow layer, and then sink back down into the inflow layer offshore. By contrast, larger particles (7-9 micron), having significant terminal velocities, fall out of the cell while over the lake and do not appear to take part in the recirculation phenomena. The role of continuous fumigation of plumes from elevated point sources is also discussed. A schematic model of the lake breeze and its effects on pollutant transport is presented. (Author abstract)

32574 **APTIC NO. 55087**

Mahlman, J. D.

A THREE-DIMENSIONAL STRATOSPHERIC POINT-SOURCE TRACER EXPERIMENT AND ITS IMPLICATIONS FOR DISPERSION OF EFFLUENT FROM A FLEET OF SUPERSONIC AIRCRAFT. *Preprint, American Inst. of Aeronautics and Astronautics and American Meteorological Society, New York, 5p., 1973. 15 refs. (Presented at the American Institute of Aeronautics and Astronautics/American Meteorological Society Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, Denver, Colo., June 11-13, 1973.)*

A three-dimensional numerical model has been developed which executes dispersion experiments for passive atmospheric tracers. The model utilizes winds from a global general-circulation model which contains realistic topography, active water vapor, and seasonally-varying radiation. The horizontal grid spacing is about 265 km. There are 11 vertical levels, the highest at about 31 km. An experiment involving a diffuse point source release of tracer into the mid-latitude, lower stratosphere, is described. Based upon the calculated tracer dispersion after 11 months of integration time, estimates of the cumulative effects and implications of a continual buildup of effluent from a supersonic aircraft fleet are presented. The calculations show that local tracer enhancements by a factor of 3800 over the global average of a 1-day source are predicted in the source region. (Author abstract)

32575 **APTIC NO. 54386**

Martinez, Jose R., Richard A. Nordsieck, and Alan Q. Eschenroeder

MORNING VEHICLE-START EFFECTS ON PHOTOCHEMICAL SMOG. *Environ. Sci. Technol., 7(10):917-923, Oct. 1973. 20 refs.*

The influence of cold-start vehicle emissions on air quality was investigated using a photochemical/diffusion model. Both the time and space distribution of cold starts were examined. A day from an Oct 1968 Los Angeles smog episode served as a baseline for determining meteorological and chemical parameters for the model. Emission inputs consisted of vehicular and stationary sources for 1968, 1971, 1974, and 1980. Stagnant conditions in the central Los Angeles basin were assumed. Cold-start emissions increased the carbon monoxide peak concentrations from 9 to 13%, while increases in ozone and nitrogen dioxide were practically insignificant. Decentralizing the starts geographically produced no significant differences from the case of uniformly distributed starts, either in pollutant loading or in air quality. Expressed as percentages, cold-start emissions exhibit a long-term upward trend, which is attributable to lower running emissions achieved by more sophisticated control systems, accompanied by thermal inertia in catalytic devices. Spreading the averaging period over th 6 am to noon time interval (as opposed to the 6 to 9 am interval) reduces the relative fractional contribution of emissions, as would delaying the startup time and the traffic peak. (Author abstract modified)

32576 **APTIC NO. 54946**

Miyakoda, K.

CUMULATIVE RESULTS OF TESTING A METEOROLOGICAL-MATHEMATICAL MODEL: THE DESCRIPTION OF THE MODEL. *Proc. Roy. Irish Acad., Sect. A, 73(9):99-130, 1973. 20 refs.*

The characteristics of an atmospheric general circulation model which has been successfully tested are presented. The model is hemispheric and has a grid size of about 270 km at mid-latitude and nine levels in the vertical, including the boundary layer, the troposphere, and middle stratosphere. Emphasis is given to the energy equation in finite difference form, the surface heat budget, treatment of the orographic effect, and the initialization of the initial condition; the effects of radiation, water vapor and its phase change, evaporation, sensible heat flux, and subgrid-scale turbulence effect are incorporated. The distribution of oceans and continents, the mountains, the sea surface temperature, and the snow coverage are also specified. The model is sufficiently capable of producing its own climatology that resembles the reality in many respects and since 1967 has been applied to 2-week prediction experiments with no serious computational or meteorological troubles. (Author abstract modified)

32577 **APTIC NO. 54192**

Nagaoka, S.

THE NUISANCES OF CURRENT PHOTOCHEMICAL SMOG. *(Gendai no nyusansu (yakkaimono) - kokagaku sumoggu). Text in Japanese. Clinician, no. 219:9-13, June 1973.*

Photochemical smog was first experienced in the early 50s in Los Angeles as a white mist caused plant damage and eye irritation. In 1970 Japan began to experience photochemical smog which differs from conventional, London-type smog in that the primary pollutants react with ultraviolet radiation from the sun to form secondary pollutants. The major constituents of smog are ozone, nitrogen dioxide, peroxyacetyl nitrate, organic peroxides (oxidants), formaldehydes, aldehydes, acrolein, organic aerosols, and nitric and sulfuric acid mists.

32578 **APTIC NO. 54382**

Nevers, Noel H. de and J. Roger Morris

ROLLBACK MODELING--BASIC AND MODIFIED. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1973. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-139.)*

The rollback or proportional model is widely used in pollution control calculations and included in the guidelines for preparing and evaluating state implementation plans. It assumes that the concentration of any long-lived pollutant at any point is equal to the background concentration of that pollutant plus some linear function of the total emission rate of the pollutant in the area which influences the concentration at that point. However, simple rollback has no experimental basis, and its theoretical basis is restricted to very unusual situations, i.e., situations involving perfect atmospheric mixing in the area of interest, or in which all emitters make the same percentage reduction. Four modified forms of rollback are derived. The first extends basic rollback to multiple categories of sources; the second extends this multiple source version to include the effects of average stack heights for the various categories; the third includes the radial distance from source to receptor; and the fourth adds wind direction frequency. All of these models are derived from the same formula, with each one differing from the others only in the number of categories into which the area emissions are divided and the method of estimating the contribution of a unit emission rate from a category to the concentration at a particular point. Rollback modeling should begin with the basic equation and proceed to the form that is justified by plausible assumptions and data availability. In most cases, the third or fourth model would be most appropriate. They may play a useful role as intermediate tools between the very simple, hand calculated rollback formula and the more advanced and complex computer models now in use. (Author abstract modified)

32579 **APTIC NO. 54847**

Ott, Walter

A PHYSICAL NUMERICAL MODEL FOR DETERMINATION OF THE INFLUENCES OF COOLING TOWERS ON THE METEOROLOGICAL CONDITIONS. *(Ein physikalischnumerisches Modell zur Bestimmung der meteorologischen Umweltbeeinflussung durch Kuehltuerme). Text in German. Meteorol. Rdsch., 26(4):97-102, 1973. 15 refs.*

The dispersion of the cooling tower emissions are dealt with in two phases. First the rising of the moist air is considered. If the horizontal wind is taken into consideration the central axis of the rising cloud is obtained, otherwise a maximum height is obtained in which heat, water droplets, and steam rise from a point or area source and spread diffusely during the horizontal dispersion phase. For calculating the rising process it is necessary to start with the conditions at the tower exit. The considerations are based on a natural draft tower where the air throughput is not increased by an installed ventilator. It is assumed that the air leaves the tower in a saturated state and water droplets form after the exit through cooling. A numerical example is calculated with data measured at the power plant Keystone which has two cooling towers each with a height of 99 m. The calculated changes of the relative humidity and of the temperature in the vicinity of the power plant are illustrated in graphs.

32580 **APTIC NO. 54909**

Peterson, James T.

ENERGY AND THE WEATHER. *Environment, 15(8):4-9, Oct. 1973. 15 refs.*

The small scale and large scale effects of waste heat generated by man's activities, of which combustion is by far the most important, are presented in relation to atmospheric temperature, convection, and vertical atmospheric motion. The most notable alteration of climate resulting from waste heat occurs over urban areas. An extreme example of urban waste heat emissions is that of Manhattan where anthropogenic heat is estimated to be two and one-half times that naturally received from the sun during the winter and one-sixth of that naturally received during the summer. The heat emissions from many large cities annually exceed 10% of the natural solar energy receipt. The most evident feature of city climate is its excess warmth, with urban-rural temperature differences averaging about 1.0 to 2.0 C. Most of the effects of urban heat islands such as lower relative humidity and decreased occurrence and density of fog are confined to the city; but a downward urban effect on precipitation (5 to 10% increase) has been observed some 40 to 50 km from the city center. Various climatic models have shown that when an anomaly of 1% of the absorbed solar energy occurs, significant alterations of climate result; on a global scale, a 1% increase in solar input or decrease of reflectivity will lead to about 1 C increase in mean surface temperature. Continuation of the thermal energy growth after the year 2000 at 4 or 5% per year would cross the 1% line on projected graphs at about 2095 and 2075, respectively, and probably result in a noticeable climatic warming on a global scale.

32581 **APTIC NO. 54216**

Probert, S. D., M. A. Hasoon, and T. S. Lee

BOUNDARY LAYER SEPARATION FOR WINDS FLOWING AROUND LARGE FIXED-ROOF OIL-STORAGE TANKS WITH SMALL ASPECT RATIOS. *Atmos. Environ., 7(6):651-654, June 1973. 8 refs.*

The detachment of the boundary layer for winds flowing around large fixed roof oil storage tanks with small aspect ratios was investigated. The wind flows are dissimilar in several respects from flows over small diameter (but higher aspect ratio) circular cylinders in wind tunnels. In particular for vertical cylindrical tanks in winds for which 4.0 times 10 to the 6th power is less than the Reynolds number (Re) is less than or equal to 2.7 times 10 to the 7th power, the greater value of Re, the smaller the wake angle, and the smaller the drag on the tank, because when Re is greater than 10 to the 4th power, the form drag is the major contributor to the total drag. The wake angle decreases with height from 148 to 34 deg along the vertical cylindrical walls of the tanks. (Author abstract modified)

32582 **APTIC NO. 54867**

Rao, A. M. and J. K. Patnaik

INFLUENCE OF AIR POLLUTANTS ON POINT DISCHARGE CURRENTS IN THE ATMOSPHERE. *Curr. Sci., 42(14):504-506, July 20, 1973. 8 refs.*

The influence of air pollutants on point discharge currents in the atmosphere was investigated. The particles were collected by impingement on the mesh fibers. The collectors were exposed simultaneously for the same duration in both the places, and during this period point discharge currents were also measured. Two point discharge current records were selected from the data taken at the Viskhapatnam locomotive shed, which is a highly polluted area, and the other two are from the records taken near the Indian Meteorological Observatory, Viskhapatnam, simultaneously to eliminate day to day differences in point discharge currents caused by different weather conditions. There is a close parallelism between the variation of point discharge currents and the variation of the pollution concentration. Usually at smaller wind speeds the concentration of pollutants will be high, in the case when the polluted source is a continuous one. But at small wind speeds, the observed concentrations were low, and at high wind speeds the concentrations were higher. The effluents coming out of the chimney were at higher temperatures than the immediate environment. The effluents would always try to escape to higher levels. When the horizontal wind speed was high, the outgoing effluents looped toward the mesh and higher concentrations were obtained. At low horizontal wind speeds less convergence of effluents towards the mesh occurred and hence low concentrations were observed.

32583 **APTIC NO. 54522**

Rao, V. R. Krishna

NUMERICAL EXPERIMENTS ON THE STEADY-STATE MERIDIONAL STRUCTURE AND OZONE DISTRIBUTION IN THE STRATOSPHERE. *Monthly Weather Rev., 101(6):510-527, June 1973. 39 refs.*

A two-dimensional circulation model of the stratosphere, incorporating the mutual interrelationships between radiation, photochemistry, and seasonal transport processes, was run under steady-state assumptions to study seasonal variations. The large-scale, quasi-horizontal eddy processes were parameterized in terms of time-zonal mean temperature and ozone mixing ratio, using the generalized diffusion formulation on a sloping surface. The computed distributions of temperature and ozone mixing ratio in the meridional plane show satisfactory agreement with the observations in different seasons, thus accounting for the considerable discrepancies between the radiative-photochemical equilibrium state and observations. The significant jetlike features such as westerlies in winter and tropical easterlies in summer are well reproduced in the upper stratosphere. As a consequence of the generalized diffusion, the mean meridional motions developed the two-cell structure typical of that found in recent observational studies of the winter lower stratosphere. Quasi-horizontal eddies and mean meridional motions contributed significantly to heat and ozone budgets, whereas the vertical eddies had little effect except to transfer ozone downward in the winter lower stratosphere. (Author abstract modified)

32584 **APTIC NO. 54635**

Raschke, Erhard and Uwe Stucke

APPROXIMATIONS OF BAND TRANSMISSION FUNCTIONS BY FINITE SUMS OF EXPONENTIALS. *Beitr. Physik Atmosphaere, 46(3):203-212, 1973. 16 refs.*

Transmission functions of water vapor and carbon dioxide in the infrared were approximated with finite sums of exponentials for convenient and time-saving use in multiple scattering calculations for the transfer of radiation in the atmosphere. With only two-six terms, an accuracy of better than 4% was obtained within the ranges of the absorber mass present in the Earth s atmosphere. Coefficients and exponents for approximations of water vapor band-transmission functions, within a given range of absorber mass at Po equals 750 mb with a finite sum of exponentials, are given. Coefficients and exponents for approximation of carbon dioxide band-transmission functions under the same conditions are used. Coefficients and exponents for the approximation of generalized transmission functions for water vapor and carbon dioxide and a transmission function for the 9.6-micron band of ozone with a finite sum of exponentials are given. (Author abstract modified)

32585 **APTIC NO. 54465**

Sakhnovskaya, N. N.

SANITARY ASSESSMENT OF THE STATE OF THE AIR RESERVOIR IN THE ZONE BY AN EXTRA-HIGH-CAPACITY STATE REGIONAL ELECTRIC POWER PLANT (SREPP). *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 35-39, APTD-1366. Translated from Russian. (Also: Zdorovya, 1970:176-181, 1970.)*

NTIS: PB 214264

Emissions from an extra-high-capacity steam power plant with a rated power of 2.4 million kW were measured. Four hundred and forty-six samples of sulfur dioxide, carbon monoxide, and dust were collected, by the itinerary method, at distances of 1-15 km from the discharge stacks. A parallel study of the meteorological conditions was also made. The range of propagation of individual components of the emissions extended over 15 km. Pollution was concentrated 3-7 km from the discharge stacks, the maximum permissible concentrations was exceeded by 9-20% of SO2, 90-100% by CO, and 80-90% of dust. Effects on nearby populated areas were measured by a questionnaire. Impurities in the air, odors, and dust deposition were reported. Complaints were made about eye irritation, coughs, and throat irritation. Plant damage was also noticed. Therefore, the present control equipment did not keep air polluting discharges to an acceptable level.

32586 **APTIC NO. 55168**

Siegel, B. Z., S. M. Siegel, and F. Thorarinsson

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND ICECAP. *Nature (London), 241(5391):526, Feb. 23, 1973. 10 refs.*

Field air sampling procedures and analyses conducted in aerometric studies at a number of sites in Iceland during June and July 1972 yielded mercury concentrations well above the range commonly cited for unpolluted air, 0.001-0.010 micrograms/cu m. The general reliability of field measurements is indicated by samples taken at the Krysuvik thermal area where duplicate analyses on each of four separate sample traps yielded a mean Hg level of 11.3 micrograms/cu m and a standard error of only plus or minus 1.8 micrograms/cu m. Atmospheric mercury may be introduced in part by degassing of fluid magmas, but release from fine ash could also serve as a vehicle. An acid condensate from Surtsey yielded on analysis 350 ppb Hg, and tephrafines collected in the first two hours of the 1970 Hekla eruption contained 375 ppb of readily water-soluble Hg. Long range transport of volcanic ejecta eastward from Iceland is well established, and examination of North Atlantic wind vector patterns show that the winds may blow as much as 30-50% of the time from east to west across Iceland toward Greenland where mercury has been found in ice cores. The time variable mercury levels cannot be viewed as evidence for human input since Iceland has recorded nearly 50 volcanic eruptions including some of the greatest in the post-glacial history of the earth.

32587 **APTIC NO. 54848**

Stuemke, Hermann

DISPERSION OF STACK GASES IN A PLAIN WITH A VALLEY OR BASIN PERPENDICULAR TO THE WIND DIRECTION. PART II. *(Ausbreitung von Schornsteingasen ueber einer Ebene mit quer zum Windfeld eingeschnittenem Tal oder Talkessel - Teil II). Text in German. Staub, Reinhaltung Luft, 33(9):344-348, Sept. 1973. 9 refs.*

Some characteristic stationary diffusion fields are presented and discussed which are obtained by combination of a uniform wind field above a higher elevated plateau with a valley running perpendicular to it which is filled with stationary air. A quantitative transfer of the results to other geometric conditions is not feasible. However, the following rules can be derived: The case A of a source ahead of the valley or basin leads generally to no higher maximum ground level concentrations than the standard case of dispersion over an uninterrupted plain. Case C of a source within a basin filled with stationary air leads to considerably higher ground level concentrations than the standard case with the same source elevation above the ground. The same is true for case B with a source above the basin. These findings agree exactly with findings from a study of a potential flow above a valley with circular arc cross section which is located perpendicular to the wind direction.

32588 **APTIC NO. 54468**

Sukharevskiy, V. M., A. P. Stel makh, and N. P. Sirily

ATMOSPHERIC POLLUTION CAUSED BY REFUSE DUMPS. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute for Crop Ecology, 1973, p. 53-57, APTD-1366. Translated from Russian. (Also: Akademiya Nauk Ukrainskoy SSR, Materialy Pervoy Ukrainskoy konferentsiii Rasteniya i promyshlennaya sreda. Kiev, 1968, p. 38-45.)*

NTIS: PB 214264

Engineering refuse dumps include combustion gases and suspended coal and rock dust which have a destructive effect upon human and and plant life. The four types of refuse dumps are refuse heaps, crested, flat, and combined dumps. In the East pit, a flat dump with some crested dumps, measurements show that the heaviest dust pollution occurs in the summer; dust pollution caused only by weathering of the dumps is moderate; the dust content is approximately five times heavier in the air near the crested dumps than it is near the heaps; and that the dust content of air at a distance of 2000 m from the dumps usually exceeds the maximum permissible concentrations. In addition to exhaling dust, refuse heaps emit noxious gases. Studies of gas pollution show that only sulfur dioxide appears at all the observation points, and that hydrogen sulfide, carbon monoxide, and carbon dioxide were detected only at certain points. The studies reveal that the SO2 concentration may vary and there is no linear relationship between the distribution of concentration of the gases and the distance from the dumps to the point of the sample collection. The maximum concentrations of SO2 are found at a distance of 100-300 m from the dumps, and at a distance of 2000 m from the dump the highest single concentration of SO2 is 6-7 times greater than the maximum permissible concentration. Control measures consist of forming new dumps far from polluted areas, stockpiling the rocks in dumps, taking steps to prevent spontaneous combustion, quenching of actively burning dumps, and planting inactive dumps with greenery.

32589 APTIC NO. 54322

Tauber, S.

MATRIX REPRESENTATION OF DYNAMIC AIR POLLUTION PROBLEMS. *Atmos. Environ., 7(6):655-656, June 1973. 1 ref.*

The vector matrix representation of the effect of a polluting system on a mass of air studied previously was extended to a time dependent system. The notation of Tauber was used, and it was assumed that the total air volume considered V equals V(t) is a function of t, the time parameter. The V(O) replaces V(i), V(t) replaces F(f), where in Tauber i and f stand for initial and final and clearly t is greater than O. The T(t) is the temperature of the gases involved p(f,m) becomes p(t,m), p(i,m) becomes p(O,m) for m equals O,l...,g, i.e., gases. It is assumed that the gases involved are sufficiently far away from the critical coordinates so that the ideal gas laws can be applied. A dynamic polluting system acting on a mass of air can be represented by a time dependent matrix acting on a vector. (Author abstract modified)

32590 APTIC NO. 54927

Tauber, Selmo and Jerzy Trau

A VECTOR PARTIAL DIFFERENTIAL EQUATION MODEL FOR AIR POLLUTION. *Atmos. Environ., 7(10):973-977, 1973. 7 refs.*

A general system of nonlinear partial differential equations for concentrations of all the components of polluted air is given and rewritten in vector matrix form, thus establishing a general mathematical model for air pollution. The system of simultaneous partial differential equations or its equivalent vector matrix is a general representation of the transport equation. Turbulent diffusion may be considered as there is no restriction on the nature of the flow field. The system depends on the knowledge of V equals V (t,x, y,z) i.e., the velocity distribution of the flow. It is a dynamical system so that V is a function of time. The vector E will in general depend on V since longitudinal and transverse turbulent diffusion are distinguished. A great deal depends on the knowledge of V which is obtained by direct observations or by adapting a mathematical model for V based on theoretical considerations. The model for the V based on theoretical considerations. The model for the pollution system is set up on a computer and the refinement of the mesh will depend on the information on V and the storage available in the machine. The last term of the system of equations comes from chemical kinetics and takes into consideration the chemical reactions taking place during the diffusion process. (Author abstract modified)

32591 APTIC NO. 54534

Tilley, M. A. and G. A. McBean

AN APPLICATION OF SPECTRUM ANALYSIS TO SYNOPTIC-POLLUTION DATA. *Atmos. Environ., 7(8):793-801, Aug. 1973. 5 refs.*

Spectral analysis techniques were used to investigate the variability of and correlations between atmospheric pollution and meteorological data for Ottawa, Canada. The variations due to diurnal and longer period oscillations were isolated. Suspended particulates (indicated by the coefficient of haze soiling index) were positively correlated with wind speed and vertical temperature difference for periods of several hours up to a few days. Variations of sulfur dioxide were correlated with wind speed oscillations of about a 3-day period. This was attributed to the synoptic weather variations of wind speed and direction. Longer time periods are recommended to improve the statistical reliability of the spectral estimates. (Author abstract modified)

32592 APTIC NO. 54212

Venter, G. P. N., E. C. Halliday, and L. A. Prinsloo

THE DETERMINATION OF THE SUTTON DIFFUSION PARAMETERS FOR THE HIGHVELD OF SOUTH AFRICA. *Atmos. Environ., 7(6):593-602, June 1973. 12 refs.*

The parameters in the Sutton equation for use by the control authorities on the South African Highveld were determined. Measurement of the Sutton parameters n, Cy, and Cz were made by the release at up to 40 m of a tracer dust at the base level 1800 m above the sea level, 30 deg latitude. Assuming an average gradient of potential temperature over the first 100 m and using regression equations for n, Cy, and Cz, the calculated concentrations overestimated the observed values by a factor of two under near neutral conditions. The down wind distance of the maximum was well predicted on the average. The parameter n was a good measure of turbulence, but values of Cy and Cz were influenced by changes in surface conditions. (Author abstract modified)

32593 APTIC NO. 54520

Vukovich, Fred M.

A STUDY OF THE ATMOSPHERIC RESPONSE DUE TO A DIURNAL HEATING FUNCTION CHARACTERISTIC OF AN URBAN COMPLEX. *Monthly Weather Rev., 101(6):467-474, June 1973. 19 refs.*

The variation of the differential heating required to depict the diurnal behavior of the urban heat island is established from data obtained in the literature and other sources. A simple, linear, three-layer model was developed to study the response of the urban atmosphere to the differential heating in the no-mean-wind case. The only driving force in the model was differential heating. The urban atmosphere experiences a short period of upward vertical motion in the early evening (the urban heat island circulation) in response to the positive differential heating at this time, and a short period of downward vertical motion in the late morning in response to the negative differential heating at that time. The latter response would prevent diffusion of pollutants in the vertical and would bring an elevated pollution layer over the city to the surface. Therefore, the dynamic response could be responsible for the production of a critical episode in the city. (Author abstract modified)

32594 APTIC NO. 54324

Weaver, Theodore W. and Arlin B. Super

ECOLOGICAL CONSEQUENCES OF WINTER CLOUD SEEDING. *J. Irrig. Drain. Div., Proc. Am. Soc. Civil Engrs., 99(IR3):387-399, Sept. 1973. 11 refs. (Presented at the American Society of Civil Engineers, Conference on Age of Changing Priorities for Land and Water, Spokane, Wash., Sept. 26-28, 1972.)*

The ecological effects of attempts to increase winter precipitation were investigated. A randomized winter orographic cloud seeding experiment was conducted in the Bridger Range of southwestern Montana during the three winters of 1969-1970 through 1971-1972. A modified Skyfire silver iodide generator located at each seeding site was operated at a rate of consumption of about 1 oz (30 g) AgI hr to the -1 power during storm or near storm conditions on all experimental days for which the random decision was to seed. General conclusions can be drawn. An operational program to increase winter precipitation might deposit 0.3 g Ag/ha/yr (9.8 times 10 to the -8th power oz Ag/sq ft/yr) and increase snowfall 10-20%. Silver iodide deposited directly on organisms will not harm them. Although Ag may be concentrated in the upper layers of the soil, harmful effects are not expected from deposits that might accumulate in 100 yr or less. Achievable increases in snowfall (about 20%) are unlikely to significantly affect the vegetation of the fescue meadows typical of the target area, but increases as large as 100% to 400% would probably have detrimental effects. (Author conclusions modified)

32595 **APTIC NO. 54408**

Weil, Jeffrey C. and David P. Hoult

A CORRELATION OF GROUND-LEVEL CONCENTRATIONS OF SULFUR DIOXIDE DOWNWIND OF THE KEYSTONE STACKS. *Atmos. Environ., 7(7):707-721, July 1973. 13 refs.*

An empirical correlation of the ground level concentrations of sulfur dioxide downwind of the Keystone stack is presented. For the dispersion of the Keystone stack plumes, the height of a convective mixing region in the atmosphere determines when the effluents are carried to ground in downward moving air currents. A model to estimate the scale of the mixing region is presented and verified with vertical temperature profile measurements. A previous model for plume rise is extended and used to determine the effective stack height. For a neutral atmosphere the plume rise is taken as the height where the plume rise velocity is is equal to a calculated r.s.m. vertical velocity scale for the mixing layer. In a stable atmosphere the level-off height of the plume is the effective stack height. A total of 781 measurements of the axial ground level concentration of SO2 downwind of the 244 m Keystone stack are empirically correlated. The distribution of the maximum concentrations from each axial profile is approximately log normal with a geometric standard deviation of two. (Author abstract modified)

32596 **APTIC NO. 54360**

Wilkniss, P. E., R. A. Lamontagne, R. E. Larson, J. W. Swinnerton, C. R. Dickson, and T. Thompson

ATMOSPHERIC TRACE GASES IN SOUTHERN HEMISPHERE. *Nature Phys. Sci., 235(142):45-47, Sept. 17, 1973. 14 refs.*

Five trace gases: carbon monoxide, carbon tetrachloride, freon II, methane, and radon were measured in the atmosphere over the North and South Pacific and the ice covered Ross Sea. Measurements were taken in Nov and Dec 1972. In the northern hemisphere, CH4 levels were slightly higher and the CO concentrations definitely exceeded those of the southern hemisphere by a factor of four. The hypothesis that CO is formed in the atmosphere by the oxidation of CH4 was not supported, since the CO levels dropped considerably in the southern hemisphere although methane values remained constant. Carbon tetrachloride showed a nearly uniform global distribution due to its probably overwhelming production by natural sources. There are no natural sources for freon, but it was present in the northern hemisphere due to industrial production. The Rn values were high in the northern hemisphere near the North American continent and decreased to levels below 1 pCim to the -3rd power near the equator. Radon levels remained low until several peaks appeared between 30 and 40 deg S where low pressure systems originating over and around Australia carried continent air across the track of Galcier. High Rn concentrations were also evident near New Zealand. From New Zealand to McMurdo Station is the Antarctic, Rn had low concentrations until two peaks were observed on Dec. 23 and 25 when the ship was near McMurdo.

32597 **APTIC NO. 54323**

Winkler, Peter

THE GROWTH OF ATMOSPHERIC AEROSOL PARTICLES AS A FUNCTION OF THE RELATIVE HUMIDITY -- II. AN IMPROVED CONCEPT OF MIXED NUCLEI. *J. Aerosol Sci., 4(5):373-387, Sept. 1973. 21 refs.*

A uniform set of growth curves of 28 aerosol samples collected in the outskirts of Mainz, West Germany and representing polluted continental aerosols of Central Europe are discussed. The atmospheric aerosol particles each consist of a mixture of different substances and show continuous smooth growth, without suddenly increased or reduced absorption of water. They are unlike pure salt particles whose growth is characterized by a sharp increase at the critical humidity. This feature is controlled by three properties of the atmospheric aerosol particles. The steady and smooth growth is caused by gradual deliquescence of soluble matter with increasing humidity, the reverse being observed for decreasing humidity. Reduced-absorption of water is caused by insoluble matter which amounts to about 40% of the aerosol mass and increase of the solubility of the various ions due to their mutual interaction in the special salt mixture forming the water soluble fraction of the aerosol particles. Variations in content of insoluble matter and in chemical composition contribute almost equally to the effect on the growth curve. Growth curves can be described by r/rO equals (1 + C F(f)/(1 f) to the 1/3rd power, where r is the radius at the relative vapor pressure f, rO is the particle radius at f equals O, F is the dissolving characteristic describing the gradual deliquescence of the water soluble matter with relative humidity, and C equals constant (sav) where s is the fraction of water soluble matter within the sample, v the ratio of the density of the aerosol particles to the density of water, and a is a dimensionless constant (a is approximately 0.14 on the average) which is a measure of the solubility of the soluble matter. (Author abstract modified)

32598 **APTIC NO. 54917**

Zeedijk, H. and C. A. Velds

THE TRANSPORT OF SULPHUR DIOXIDE OVER A LONG DISTANCE. *(Atmos. Environ., 7(9):849-862, 1973. 18 refs.*

Sulfur dioxide concentration was continuously measured in the atmosphere of Eindhoven, a medium-sized town in the Netherlands characterized by cleanness in industry, during the winters of 1967/1968 and 1968/1969 in order to field test a newly developed air pollution monitoring station. The air pollution was expected to be low due to a large-scale change-over from the burning of coal and oil to the use of natural gas for industrial and domestic heating in the year preceding the beginning of the field measurements. Generally, these expectations were borne out except for high sulfur dioxide concentrations which sometimes occurred in easterly winds, in contrast to the relatively slight urbanization east of the measuring station. The high sulfur dioxide concentration at Eindhoven is hypothesized to be caused by the German Ruhr area situated at 100 km distance; analysis of the data supported this view. Transport of sulfur dioxide is promoted by strong winds and by either a stable atmosphere or a low-level inversion in the atmosphere. The industrial area of Antwerp was also indicated as an influence to high sulfur dioxide readings, though no influence from the industry of Rotterdam with its many oil refineries could be distinguished. (Author abstract modified)

1972

32599 **APTIC NO. 54226**

Alkezweeny, A. J. and W. G. N. Slinn

AEROSOL PARTICLE SIZE DISTRIBUTIONS IN THE NORTHWEST. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 45-50, Dec. 1972. 3 refs.*

NTIS: BNWL-1651 PT1, UC-53

Surface level, aerosol particle size distributions were measured at several sites in Washington State: near Richland, at Seattle, and on the Olympic Peninsula since a knowledge of the characteristics of background atmospheric aerosols and gases is important in the evaluation of the effect of contaminant releases. The size distribution of the background aerosol particles near Richland for particles between 0.2 to 2 micron in diameter were approximated by the formula D to the minus alpha power, where D is the particle diameter and alpha is about 5. Another finding pointed to significant variations in particle size distributions obtained on different days near the coast, at sites separated by only a few tens of kilometers and under similar meteorological conditions. The effect of wind on particle growth, nucleation, and cloud physics are mentioned. Resuspension of aerosol particles by winds can be relatively easily studied by determining the changes in the size distribution. The Richland data are representative of an unpolluted continental atmosphere, the Seattle data were representative of a polluted atmosphere, and the Olympic Peninsula data are characteristic of a maritime aerosol.

32600 **APTIC NO. 54659**

Angell, J. K., D. H. Pack, L. Machta, C. R. Dickson, and W. H. Hoecker

THREE-DIMENSIONAL AIR TRAJECTORIES DETERMINED FROM TETROON FLIGHTS IN THE PLANETARY BOUNDARY LAYER OF THE LOS ANGELES BASIN. *J. Appl. Meteorol., 11(3):451-471, April 1972. 14 refs.*

Between Sept. 9 and Oct. 2, 1969, 105 constant-volume balloons (tetroons) were released from various sites in the Los Angeles Basin for the purpose of obtaining three-dimensional air trajectories in the planetary boundary layer of the Basin. The tetroons, with transponders attached, were tracked by an M-33 radar positioned atop Mt. Thom, 5 km north of Glendale. In general, the tetroons at heights of a few hundred meters tended to move slowly westward between midnight and sunrise, slowly northward between sunrise and noon, and rapidly eastward between noon and sunset. Tetroons launched from Redondo Beach and the Long Beach area during the day distinctly showed the convergence zone extending northeastward from the Palos Verdes Hills due to the confluence of sea breezes from the west and south. Tetroons released near the downtown area around sunrise tended to drift toward city center before moving northeastward into the Pasadena Glendale area. During the day the tetroons oscillated through much of the depth of the mixed layer beneath the inversion, but at night the vertical oscillations were usually very small. The tetroon trajectories were compared with surface trajectories derived from the extensive surface wind network within the Basin, and the ratio of trajectory separation distance to tetroon travel distance averaged about 0.2 during the day and 0.4 at night. Oxidant readings obtained by a helicopter following along the tetroon trajectories were compared with fixed-point readings, and downwind of the city center most of the increase in oxidant during the day was due to photochemical effects on individual volumes of air and not due to advection of previously-existing high values of oxidant into the area. (Author abstract)

32601 **APTIC NO. 54221**

Atkinson, D. G., W. E. Davis, L. F. Radke, B. C. Scott, W. G. N. Slinn, T. M. Tanner, J. M. Thorp, N. A. Wogman, and J. A. Young

PRECIPITATION SCAVENGING OF TRACERS RELEASED INTO FRONTAL STORMS. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 1-16, Dec. 1972. 9 refs.*

NTIS: BNWL-1651 PT1, UC-53

Two field projects were undertaken to evaluate the feasibility of in-cloud precipitation scavenging experiments in frontal storms and to compare the rainout rates for aerosol tracers of different physical and chemical properties. The field system included PPI and RHI radar coverage, hourly radiosondes, airborne cloud physics measurements, and a sampling grid of approximately 100 collectors. The first experiment (tracers released at approximately 1.5 km) resulted in a well defined deposition pattern for indium (released via pyrotechnic flares), but apparently the chemical analysis for lithium (lithium stearate dispensed mechanically) was insufficiently sensitive. The second experiment in which silver iodide and indium were released simultaneously via pyrotechnic flares at approximately 4 km resulted in identifiable indium and silver deposition patterns. These patterns suggest a substantially larger in-cloud removal rate for the ice nuclei than for the indium aerosol which was determined to be essentially inactive as an ice nucleus at temperatures above 22 C. Further experiments are in progress. (Author abstract)

32602 **APTIC NO. 55030**

Collins, B. G.

ATMOSPHERIC TURBIDITY AT ASPENDALE, VICTORIA, FROM PYRHELIOMETRIC MEASUREMENTS. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 152-154. 6 refs. (May 15-18.)*

Atmospheric turbidity coefficients (Beta) were measured at Aspendale, Victoria, by pyrheliometric means during 1968 to 1971. Beta was greater than 0.070 on 16 of the days throughout the period on which mean turbidity readings were obtained and less than 0.020 on 15 of the days. The overall maximum and minimum values were 0.200 and 0.004 respectively. Occasions of high turbidity had predominantly light northeasterly airflow, and those of low turbidity occurred when the air had a maritime trajectory during the preceding 24 hr either from the west/southwest or from the east/southeast. Comparison with non-industrial localities in Switzerland and Jerusalem was favorable, and values for Aspendale were much lower than those reported from the eastern section of the United States.

32603 **APTIC NO. 54225**

Dana, M. Terry

WASHOUT OF RHODAMINE DYE PARTICLES. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 36-45, Dec. 1972. 11 refs.*

NTIS: BNWL-1651 PT1, UC-53

Results are presented from a series of washout experiments in which submicron-sized rhodamine dye particles were dispensed by an ultrasonic nozzle. Particle mass median radii from 0.08 to 0.21 micron were dispensed by atomization of methanol-rhodamine solution droplets of initial radii of 2.5 micron. Experimental collection efficiencies for the current set of experiments and previous ones (pneumatic atomization) were plotted as a function of expected particle radius. Values representing inertial washout theory for particle densities appropriate to solid rhodamine (1.38 g/cu cm) and methanol (0.8 g/cu cm) were also plotted. Three potentially influential processes were considered in an attempt to explain a divergence between experiment and theory: dry deposition, undercutting of the plume by precipitation, and washout of unevaporated methanol droplets. Indications were that the results of many experiments could have represented washout of solution droplets larger than the desired dry particles. Additional considerations such as Brownian diffusion for particles of less than 0.1 micron, thermophoresis for particles up to 1 micron, and electrical effects for the same size range as the latter are also presented as washout mechanism possibilities. The inertial theory allows for collection efficiencies in excess of unity for the particle size range above 10 micron.

32604 **APTIC NO. 54223**

Davis, W. E.

COMPUTER RESULTS FOR AN IN-CLOUD RELEASE ON INDIUM ON 11 MARCH 1971. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 16-19, Dec. 1972. 2 refs.*

NTIS: BNWL-1651 PT1, UC-53

The observed deposition pattern of indium was compared with the predicted deposition pattern of an in-cloud scavenging model in an effort to interpret the observed pattern and to determine whether detectable quantities of indium would be seen at the ground from an in-cloud release. A liquid water content of 0.29 g/cu m was assumed as input for the dilution coefficient (psi); measurement of liquid water content was not available because of instrument failure. A parcel precipitation rate was determined from both radiosonde and aircraft data; and using the mean rate of rise and assuming the liquid water content to be constant, a range of psi s was determined between 0.0002/sec to 0.001/sec. The dilution coefficient and the in-cloud scavenging coefficient were assumed constant for each computer run. A range of in-cloud scavenging coefficients from 0.001 to 0.01/sec was found for a range of dilution coefficients from 0.0002 to 0.001/sec. Comparison of the maximum indium deposition versus dilution coefficient indicated that at approximately 750 sec the deposition rate was still increasing. Data such as liquid water content, rainfall, and snowfall rate through the plume were not observed; hence, considerable care should be used in drawing conclusions from the data.

32605 **APTIC NO. 55194**

Dyer, A. J.

GLOBAL POLLUTION AND CLIMATIC CHANGE. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 12-16. 4 refs. (May 15-18.)*

Increases in atmospheric carbon dioxide and particulate matter as a result of man s activities are identified as the main possible sources of a long-term change in global climate. Current understanding of atmospheric processes is not sufficient to permit an accurate assessment of the final outcome, although warming due to CO2 and cooling due to particualte matter are estimated to be of similar magnitude. An important aspect of all theories of climate is whether or not feedback mechanisms, either positive or negative, are correctly described by the theory. Numerical models of the atmosphere using the basic knowledge of physics offer the greatest possibility of accurate prediction. Monitoring on a global scale will also be necessary to keep a check on the likely ingredients of climatic change. (Author abstract)

32606 **APTIC NO. 54630**

Edinger, James G., Morris H. McCutchan, Paul R. Miller, Bill C. Ryan, Mark J. Schroeder, and Joseph V. Behar

PENETRATION AND DURATION OF OXIDANT AIR POLLUTION IN THE SOUTH COAST AIR BASIN OF CALIFORNIA. *J. Air Pollution Control Assoc., 22(11):882-886, Nov. 1972. 8 refs.*

The penetration and duration of oxidant air pollution in the South Coast Air Basin of California was investigated. On June 18, 19, and 20, 1970, two aircraft, a rawinsonde, two pilot balloons stations, and ground stations provided simultaneous samples of total oxidant, temperature, and winds up to 8000 ft in an area extending from Santa Monica, Calif., east to Redlands, and north across the San Bernardino Mountains. The photochemical oxidant formed in the marine layer is vented up to the slopes and over the crest of the San Bernardino Mountains during the day. At 1600 PST concentrations were less than 0.10 ppm at the coast, but values greater than 0.40 ppm were found inland. Layers of high oxidant concentrations were detected above the inversion base, suggesting that some pollution is vented up the slopes and subsequently advected back to the south. The diurnal changes in the temperature inversion also contributed to the high concentration found above the inversion base. These processes resulted in multilayers of pollution. The daily peak concentrations of sulfur dioxide which occurred simultaneously with oxidant at Rim Forest (5680 ft) were sufficiently high (between 0.05 and 0.10 ppm) to suggest an interaction between SO2 and ozone in causing tree damage. The hydrocarbon distributions demonstrated the potential utility of such data as a vertical tracer of automobile exhaust and in tracing the origin and photochemical age of photochemical air pollution. (Author abstract modified)

32607 **APTIC NO. 54228**

Gibbs, A. G. and W. G. N. Slinn

FLUCTUATIONS IN TRACE GAS CONCENTRATIONS IN THE TROPOSPHERE. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 61-64, Dec. 1972. 2 refs.*

NTIS: BNWL-1651 PT1, UC-53

A simple model is devised and approximations are made in an attempt to explain the observed dependence on removal rates of fluctuations in trace gas concentrations in the troposphere. Considering the case of first order removal processes and using a coordinate system moving with the air mass (ignoring diffusion) a general expression is set up and linearized to obtain a solution for the coefficient of dispersion of the fluctuations of the gas concentration arising from variations in the production rate. The model suggests that this coefficient of dispersion is proportional to the rate of removal of the gas to the one-half power, assuming the gas sampling is done at a single location for which the concentration fluctuations could be attributed to different long range trajectories of the air masses. (Author abstract modified)

32608 **APTIC NO. 54231**

Hales, J. M. and D. W. Glover

AN INEXPENSIVE INFUSION SAMPLER FOR ATMOSPHERIC TRACER STUDIES. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part I. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 101-103, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

A simple and inexpensive infusion sampler for remote field use has been designed to aid in the description of plume and air mass behavior in dispersion and washout studies. The sampler consists of a Plexiglas cylinder (2-inch bore tubing) containing a piston (2-inch diameter Plexiglas rod) which is raised at a constant rate by a 12 volt d.c. timing motor. Power for the motor is provided by replaceable D cell batteries, and the unit is housed in a small plywood shelter. Depending on the size of the drive wheels, the sampler can obtain its total sample volume of approximately 0.5 l over periods ranging from 1 to 2 hr. Sampling is terminated automatically upon filling the sampler volume by action of a top-mounted limit switch. The sampler has been constructed primarily for use with sulfur hexafluoride and halogenated organics. Samples are injected into a gas chromatograph for analysis. Cost of the sampler is about $30.00 per unit.

32609 **APTIC NO. 55176**

Herman, Benjamin

THE INFLUENCE OF ATMOSPHERIC AEROSOLS ON THE FLUX OF INFRA-RED RADIATION THROUGH THE ATMOSPHERE. *Preprint, American Meteorological Society, Boston, Mass., p. 29-30, 1972. 12 refs. (Presented at the Conference on Atmospheric Radiation, Fort Collins, Colo., Aug. 7-9, 1972.)*

The influence of aerosols in the atmospheric window region between 8.4 micron and 12.1 micron is examined. The aerosols are assumed to be composed of silicates with indices of refraction as given by Peterson and Weinman. Since the optical properties are equal along two orthogonal directions (the ordinary ray) and differ along the third (extraordinary ray), the ordinary and extraordinary values of the index of refraction were weighted by 2/3 and 1/3 respectively. Other than aerosols, the only other radiationally active constituent was assumed to be water vapor. Absorption coefficients as given by Davis and Viezee were used throughout the portion of the spectrum studied. Emission and absorption by water vapor and aerosols, as well as scattering by the aerosols were included. Results will be shown for several aerosol, water vapor, and temperature distributions in the vertical, over the wavelength interval studied. Curves will be shown giving the vertical variations of flux and flux divergence, as well as the upward and downward fluxes at the top and bottom of the atmosphere as a function of wavelength. These results will be compared to those obtained in the absence of aerosols (or when aerosols are ignored) to assess the effect of these particulates.

32610 **APTIC NO. 54440**

Hogan, A. W., M. H. Degani, and C. Thor

STUDY OF MARITIME AEROSOLS. *Atmospheric Sciences Research Center Scotia, N. Y. and New York State Univ. Maritime College, Bronx, N. Y., Environmental Protection Agency Contract 70-64, EPA-R3-72- 025, ASRC-SUNY 220, 44p., Sept. 1, 1972. 16 refs.*

NTIS: PB 214170

A survey of the atmospheric aerosol concentration over the seas was used to evaluate the sources and sinks of these particles. A portable photoelectric aerosol detector was supplied to each ship and observations were made four times per day. This data is logged as a function of position and date. Aerosol concentration, position, time, and meteorological data were keypunched, and the computer analysis related variations in aerosol concentrations to meteorological parameters. Lowest concentrations of aerosol were found in mid-ocean, while the highest were found nearest shore. A relatively smooth gradient existed. Mid-ocean level aerosol concentrations were close to shore during periods of cloudiness, fog, or precipitation, and when the land mass had a long overwater trajectory. High concentrations were found far at sea in times of clear, stable weather. These high concentrations followed a hyperbolic decay to mid-ocean, east of the densely populated areas of the U. S. Continents were the major source of the particles, which were carried far out to sea in fair weather. Aerosol concentrations were extremely variable at sea.

32611 **APTIC NO. 55195**

Lucas D. H.

CHOOSING CHIMNEY HEIGHTS IN THE PRESENCE OF BUILDINGS. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 47-52. 2 refs. (May 15-18.)*

Selection of chimney heights in the presence of buildings differs from that of open situations in so far as the former requires a higher chimney to maintain given air pollution standards. Building heights up to 40% of the height of the open plain chimney require only a marginal increase in chimney height, while increases in building height above 40% require equivalent increases in chimney height to the increase in building height, if the building is close to the chimney. A simple method is proposed for correction the range of chimneys below 30 m for different sizes of building and for different distances between building and chimney; it can also be applied when many buildings are present. The constants determining the key points in the procedure and the shape of the interpolated curve need to be substantiated by experimental work. (Author abstract modified)

32612 **APTIC NO. 54233**

Nickola, P. W.

COMPARISON OF MAXIMUM EXPOSURES AT GROUND LEVEL RESULTING FROM SIMULTANEOUS RELEASE OF TRACERS FROM TWO ELEVATIONS. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 114-118, Dec. 1972. 2 refs.*

NTIS: BNWL-1651 PT1, UC-53

Results from field experiments in which two atmospheric tracers were simultaneously released from different elevations were used to compute the ratio of exposures resulting from the two levels of release. The maximum exposures measured at distances as far as 12.8 km from the source were put in the form of a ratio with the exposure resulting from the lower release elevation as the denominator. The data were normalized to the mass of tracer emitted but not to wind speed. Arbitrary stability classes were used to group the data on the basis of Richardson numbers computed for the layer between 2 m and 15 m. The classes were moderately stable, slightly stable, slightly unstable, and moderately unstable with corresponding Richardson number ranges of greater than 0.10, 0.10 to 0, 0 to -0.10, and less than -0.10. The magnitude of the ratios was generally related quite strongly to atmospheric stability. Discrepancy between Pasquill s curves and the experimental slightly stable and moderately stable data was not out of bounds at distances out to about 2 km, but beyond that distance, Pasquill s curves significantly overestimated the benefits expected from the increase in elevation of release.

32613 **APTIC NO. 54234**

Nickola P. W. and J. D. Ludwick

PRELIMINARY CONCENTRATION MEASUREMENTS OF PUFFS RELEASED DURING NEAR CALM WINDS. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 119-122, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

The Hanford inert gas field grid has been revised in order to better measure puffs of krypton-85 released under stagnant atmospheric conditions. Two puffs of krypton have been released on this grid to date; and results suggest that if tracer concentration is considered as a function of distance, the stagnation conditions produce lower concentrations than do releases into stable atmospheres with steady wind directions. In considering short period (5 sec) mean concentrations as a function of time, stagnation tests produced higher concentrations than the steady wind case at times greater than 500 sec after release. (Author abstract)

32614 **APTIC NO. 54235**

Nickola, P. W.

A COMPARISON OF EXPOSURES RESULTING FROM INERT GAS RELEASES WITH EXPOSURES PREDICTED WITH THE AID OF PASQUILL S DIFFUSION CATEGORIES. *In: Pacific Northwest Laboratory*

Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 123-125, Dec. 1972. 2 refs.

NTIS: BNWL-1651 PT1, UC-53

Normalized exposures resulting from near ground level release and sampling of plumes of the inert gas tracer, krypton-85, were lower than exposures predicted with the aid of graphs based on Pasquill s diffusion categories. Pasquill s curves overestimated the observed exposures by a factor of three to five for this reasonably ideal tracer. Since for a given meteorological condition the use of an inert gas tracer should result in higher downwind concentrations than would be expected with particulate or chemically reactive pollutants, these results suggest Pasquill s curves are too conservative. Exposures resulting from instantaneous puff releases averaged three times the magnitude of those resulting from 10 to 20-minute plume releases. Pasquill s curves, although designed for use with continuous releases, appear to more reasonably predict exposures for the puff releases. (Author abstract modified)

32615 **APTIC NO. 54247**

Powell, D. C. and C. E. Elderkin

PROFILE-DERIVED ESTIMATIONS OF CROSSWIND INTEGRATED EXPORURE FROM ELEVATED RELEASES: METHOD OF INVESTIGATION. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 171-173, Dec. 1972. 6 refs.*

NTIS: BNWL-1651 PT1, UC-53

A method is proposed for estimating without turbulence measurements the crosswind integrated exposure at ground level to a depositing tracer released at an elevated source in the surface boundary layer. The meteorological inputs for the calculations are: the quantity of tracer released, the height of release, the mean wind speeds measured at 15 and 2 m, and the Richardson number calculated from data taken at the same two heights. Estimation of the friction velocity is performed first from these data, followed by calculation of values of sigma z (square root of the variance of vertical dispersion) for the tracer at downstream distances corresponding to sampling arc locations using a spectral model and the Hay-Pasquill beta equation. Finally, the crosswind integrated exposure is calculated from a Gaussian equation and corrected using deposition velocity that is a function of the input variables. (Author abstract modified)

32616 **APTIC NO. 54236**

Ramsdell, J. V.

EXAMINATION OF THE RELATIONSHIP BETWEEN THE SIZE AND SHAPE OF THE REAL PLUME AND ITS POSITION. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 126-130, Dec. 1972. 4 refs.*

NTIS: BNWL-1651 PT1, UC-53

The assumption that the size and shape of a real (instantaneous) plume are independent of the position of its centroid at any fixed distance from the source has been examined using a krypton-85 data and time series analysis. Correlograms were constructed for the relationships between the real plume size and shape parameters and the position parameter in order to examine the validity of this assumption and to investigate the observed statistical significance of autocorrelations of real plume width and the coefficient of skewness at 800 m and time-lag of 38.4 sec. The results indicate that the assumption that the real plume size and shape are independent of position is correct; at the same time, it is concluded that a sampling increment shorter than 38.4 sec is necessary for examination of the relationships between the real and apparent plumes at 800 m in order to reduce distortion caused by meandering. It is suspected that the duration of the sampling period must be decreased as the distance from the source is increased, although the distances with which this applies are not yet determined.

32617 **APTIC NO. 54237**

Ramsdell, J. V.

ABSOLUTE PEAK-TO-MEAN CONCENTRATION RATIOS. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 130-133, Dec. 1972. 3 refs.*

NTIS: BNWL-1651 PT1, UC-53

Absolute peak-to-mean (P/M) concentration ratios, defined as the ratio between a maximum short-term concentration at any given position and the time-average concentration at the mean plume axis, have been examined as a function of both position in the plume and the time ratio. A striking feature of the relationship between the absolute peak-to-mean ratio and normalized crosswind positions in that the maximum absolute P/M ratios occur at the mean plume axis. A relatively flat portion of the curves for the relationship near the center of the mean plume is the result of plume meander, and its extent essentially defines the limit of meandering of the axis of the instantaneous plume. The relationship between absolute P/M concentration ratios and the time ratio indicates that, as with conventional P/M ratios, the absolute P/M ratio monotonically increases with increasing time ratio. Unlike the conventional P/M ratio, however, the absolute ratio does not start from a common point at a time ratio equal to one; rather the absolute P/M ratios appear to converge at some large value of time ratio.

32618 **APTIC NO. 54238**

Ramsdell, J. V.

AN EXTENSION OF THE PEAK-TO-MEAN CONCENTRATION RATIO MODEL. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 134-136, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

The peak-to-mean concentration ratio model developed in 1969 for ground-level plumes has been extended to predict ground-level peak-to-mean ratios in elevated plumes. The extension of the model was performed by assuming that the rate at which a ground-level plume diffuses upward and the rate of downwind diffusion of an elevated plume are equal. It was also assumed that a cross section of the plume perpendicular to its axis would be roughly elliptical in shape. Estimates of the standard deviation of the vertical distribution of a krypton 85 diffusion tracer were then obtained using the bivariate normal equation and measured values of the centerline concentration, windspeed, and sigma y. Complete reflection of the plume at the ground was assumed for these estimates. The extended model was used to predict the peak-to-mean ratio corresponding to each of several observed values, and the predicted values were reasonably close to the observed values. The most important feature was that in no case did the model significantly under predict a peak-to-mean ratio.

32619 **APTIC NO. 54441**

Rodhe, Henning, Christer Persson, and Ove Akesson

AN INVESTIGATION INTO REGIONAL TRANSPORT OF SOOT AND SULFATE AEROSOLS. *Atmos. Environ., 6(9):675-693, Sept. 1972. 20 refs.*

Daily measurements of soot and sulfate aerosols at urban and nonurban locations in Southern Sweden have demonstrated that appreciable long range transport of these substances occurs with the source regions in the southeast to southwest directions. Comparison with anthropogenic emissions demonstrated that distant sources, more than 1000 km away, gave significant contributions. Study of the formation rate of sulfate aerosols from the oxidation of sulfur dioxide indicated that only about 5% of the emitted sulfur had become oxidized and formed sulfate aerosols within the first tens of minutes that the air parcel remained within the town. Visibility observations have suggested a clear correlation between sulfate concentration and total aerosol mass, though the mass of sulfate ions is only a small fraction (3-4%) of the total aerosol mass. The influence of precipitation and monthly mean values of SO2 soot, and sulfate are described. (Author abstract modified)

32620 **APTIC NO. 55144**

Schulz, J. F.

SELF POLLUTION OF BUILDINGS. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 201-210. 20 refs. (June 4-7.)*

Problems of pollution in and around building are presented. The first element of building pollutions is the natural air movement within it created by the chimney effect or difference in air density between warm and cold air. The best solution to the natural building pressures is the use of the chute fed incinerator, where the chute can be placed under a negative pressure overcoming the chute outflow effect. The draft inducer must be properly designed and must operate continuously on the chimney exhaust. Negative pressures well above natural or mechanical building pressures will convey refuse through a building and require that all air flow is directly into the chute, thus avoiding building contamination. The height of the eddy above the ground will be 1.5 times the building width; termination of a chimney below the eddy zone will result in exhaust products being carried back to the building to reenter through air intakes or by infiltration. Coolie caps and most chimney caps defeat the proper functioning of a chimney designed above the eddy area since the cap forces the pollutants below the eddy area and close to the roof. The rain cap can be eliminated and a tee and pier supported chimney with a drain can be used.

32621 **APTIC NO. 54239**

Sehmel, G. A.

TRACER PARTICLE RESUSPENSION CAUSED BY WIND FORCES UPON AN ASPHALT SURFACE. *In: Pacific Northwest Laboratory Annual Report For 1971 To the USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 136-138, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

Particle resuspension rates caused by wind stresses upon dry tracer particles were determined in field tests on an asphalt surface. The rates were determined by using a mass balance around the initial zinc sulfide placed on the asphalt, by the air and ground exposures, and by the sampling time. The fraction of tracer resuspended per second for average windspeeds from 2 to 9 mi/hr was from 5 times 10 to the -9th power to 6 times 10 to the -8th power. The fraction of tracer resuspended increased for average windspeeds from 3 to 14 mi/hr when a man walked once through the tracer. The fraction resuspended per walk was from 1 times to to the -5th power to 7 times 10 to the -4th power. A very rough windspeed effect was suggested by an apparent correlation between wind gusts and the response of the real-time sampler. There was some indication that wind gusts greater than 15 mi/hr rapidly resuspended particles.

32622 **APTIC NO. 54242**

Sehmel, G. A. and F. D. Lloyd

AIRBORNE DUST CONCENTRATIONS. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 143-145, Dec. 1972.*

NTIS: BNWL-1651 PT1, UC-53

An airborne dust concentration of 189 mg/cu m which occurred during high winds (average wind speed of 29 mi/hr) on Jan. 11, 1972 was used to extrapolate airborne dust loadings measured in 1950 for wind speeds less than 18 mi/hr at a 4-foot elevation. Though the 1950 dust concentrations displayed a considerable scatter, an exponential dependency upon wind velocity was suggested, and hence the smooth curve representing airborne dust concentration as a function of air velocity was redrawn on log-log coordinates and extrapolated to the 189 mg/cu m dust concentration for the January 11, 1972 dust storm. Based upon current knowledge, it appears reasonable to extend the 1950 curve to the current data point. Since dust concentrations are also a function of height, the comparison of concentrations at the 1 and 4-foot level may be biased. Nevertheless, the expectation of similar rapid increases of dust concentrations with wind velocity for any height would appear reasonable.

32623 **APTIC NO. 54243**

Sehmel, G. A. and S. L. Sutter

DEPOSITION VELOCITIES IN A WIND TUNNEL. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 148-150, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

Deposition velocities for monodispersed particles of uniform diameter were measured for deposition onto a smooth, electrically grounded brass surface located on the floor and ceiling of a wind tunnel. Deposition curves for both the floor and ceiling indicated that re-entrainment begins at about 9 micron for a dry surface and at about 14 micron for a brass surface coated with a thin layer of petroleum jelly. Particle deposition velocities to the ceiling show the same functional increase with particle diameter as for deposition on the floor. The principle differences are that the deposition velocities are less and that particle re-entrainment occurs more readily from the ceiling. Particle re-entrainment occurs for 4 micron diameter particles (and smaller) at a wind speed of 30 mph. The fact that particle deposition to the ceiling shows the same maximum at about 9 micron as for deposition to the floor indicates that gravitational force can have a minor effect on particle deposition for some circumstances. (Author abstract modified)

32624 **APTIC NO. 54244**

Sehmel, G. A. and T. W. Horst

DEPOSITION VELOCITIES AS A FUNCTION OF PARTICLE CONCENTRATION REFERENCE HEIGHT AND ATMOSPHERIC STABILITY. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs.,* *Atomic Energy Commission Contract AT(45-1):1830, p. 150-153, Dec. 1972. 2 refs.*

NTIS: BNWL-1651 PT1, UC-53

Deposition velocities were caluclated from a model based upon particle effective eddy diffusivities being greater than the eddy diffusivities of air momentum in the region closer than 1 cm to the deposition surface. These predicted deposition velocities were used to determine the relative constancy of deposition velocity when the height for defining the particle concentration was increased from 1 cm (K1) to 10 m (Kz). The ratio of Kz/K1 was nearly unity in stable, unstable, and adiabatic atmospheres for particle diameters from about 0.01 to 5 micron. This constancy reflects the fact that the controlling resistance to particle mass transfer is below 1 cm. For deposition concentration ratios as a function of friction velocity and reference height, the Kz/K1 ratio is nearly unity at a K1 of 0.1 cm/sec; and as the deposition velocity K1 increases to 1 cm/sec, the ratio Kz/K1 decreases to about 0.4 to 0.8. These Kz/K1 values suggest that the controlling particle mass transfer resistance is still within 1 cm of the deposition surface. Consequently, particle deposition velocity data from a wind tunnel can be used to realistically predict particle deposition to many atmospheric surfaces. (Author abstract modified)

32625 **APTIC NO. 54245**

Sehmel, G. A.

DEPOSITION VELOCITIES OF RESUSPENDED PARTICLES. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 153-154, Dec. 1972.*

NTIS: BNWL-1651 PT1, UC-53

Particle deposition velocities were calculated from field experiments for the determination of zinc sulfide particle resuspension from asphalt surfaces. The experimental deposition velocities ranged from a minimum of 0.4 cm/sec to a maximum of 17 cm/sec for the resuspended ZnS. Although the ZnS has a mass medium diameter of about 5 micron and a number medium diameter of about 2 micron, the particle sizes characteristic of the deposition velocities are unknown. For some experiments, the deposition velocity decreased as a function of distance from 0 to 30 ft downwind from the asphalt. The trend was not definable in other experiments. The median deposition velocity was 1.7 cm/sec and the medium was 3.8 cm/sec.

32626 **APTIC NO. 55275**

Shiozawa, Kiyoshige, Atsushi Ootaki, and Shinichi Okamoto

STUDY ON THE PRECIPITATION OF SULFUR DIOXIDE CONCENTRATION BASED ON METEOROLOGICAL FACTORS. *Mem. Sch. Sci. and Eng. Waseda Univ., no. 36:57-75, 1972. 11 refs.*

The relationship between air pollution and meteorological conditions was investigated and a statistical prediction model for sulfur dioxide concentration was built in order to prevent extreme air pollution. Primary meteorological factors influencing air pollution are the emission intensity of various sources, the conditions of atmospheric diffusion as wind speed, the atmospheric stability, the precipitation which relates to the cleanup of the pollutants, and the wind direction which relates to the transportation of the pollutants from various emission sources. The secondary factors are the atmospheric pressure, the atmospheric pressure gradient, the vapor pressure, the dew point temperature, the relative humidity, and the isolation. The atmospheric pressure gradient is the difference between the atmospheric pressure of that hour and the previous hour. The statistical prediction model of SO2 concentration of the preceding 24-hour period was built according to factorial analysis and is applicable. The accuracy of the maximum concentration during the daytime is not satisfactory. (Author abstract modified)

32627 **APTIC NO. 54224**

Slinn, W. G. N.

AN ANALYSIS OF DIFFUSION IN WIND SHEAR. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 25-29, Dec. 1972. 6 refs.*

NTIS: BNWL-1651 PT1, UC-53

A theoretical framework is presented to describe turbulent diffusion in an atmosphere with a nonzero gradient of the mean wind. Moments of the convective diffusion equation are taken; and if these are terminated at the second moment, then the contaminant concentration is approximated to be Gaussian with specified covariance matrix. The results demonstrate that for turbulent diffusion a gradient in the mean velocity of the fluid influences the diffusion. The diffusion about the mean position is ellipsoidal, instead of spherical, with the principal axes orientation dictated by the gradient of the wind. An essential difference of the present result from that in Brownian diffusion is the appearance of the time in the correction terms. Restriction of the analysis to mean winds which vary at most linearly with the coordinates appears to be an essential restriction since otherwise closure of the moment equation would not be obtained. (Author abstract modified)

32628 **APTIC NO. 54227**

Slinn, W. G. N.

ON THE DRY DEPOSITION OF SEA SALT NUCLEI. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 51-55, Dec. 1972. 8 refs.*

NTIS: BNWL-1651 PT1, UC-53

An attempt has been made to determine what deposition velocities would result for sea salt nuclei under the condition that dry deposition from the atmosphere is controlled (i.e., rate limited) by the turbulent diffusive transfer of the sea salt to the collecting surface. Solving a two dimensional convective diffusion equation subject to specific boundary conditions and using suggested values, deposition velocities were calculated at 25 cm/sec in one case and 30 cm/sec in another case. Assumming that momentum and contaminants have diffusivities of similar magnitudes, the deposition velocity was equal to von Karman s constant multiplied by the friction velocity. A time constant for the removal of sea salt by dry deposition over continents was calculated to be of the order of 10 hours. Although it is not clear whether this is an unrealistic time constant, the objective of determining, within the approximations utilized, what the deposition velocity would be if turbulent diffusion were the rate limiting stage of dry deposition of sea salt nuclei has been accomplished.

32629 **APTIC NO. 54229**

Slinn, W. G. N.

KINEMATICALLY POSSIBLE FLOWS EXTERIOR TO JETS AND PLUMES. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 73-82, Dec. 1972. 6 refs.*

NTIS: BNWL-1651 PT1, UC-53

A progress report is given of analytical analyses of flows exterior to jets and plumes penetrating into the half space z which is greater than zero. The results indicate that the flow is essentially horizontal exterior to jets and plumes emerging into a half space and that the speed varies inversely to the distance from the axis. Thus, an estimate of the fate of a radiation leak near a cooling tower can be evaluated. Furthermore, since the exterior flow is essentially horizontal, the interaction between jets and plumes and the influence of a mean wind can be studied relatively easily. Hence, interesting qualitative results have been obtained for the tilt and the merging of plumes and their bifurcation. The results should not be applied to describe the flow exterior to a tall stack since only the case for jets or plumes emerging into the half space z greater than zero has been considered. Turbulent jets and bouyant plumes are discussed.

32630 **APTIC NO. 55150**

Tucker, G. B

THE ROLE OF DYNAMICAL MODELS OF THE ATMOSPHERE IN POLLUTION PROBLEMS. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 5-12. 9 refs. (May 15-18.)*

The salient features of numerical dynamic models of the atmosphere are described, together with the scheme used in a quantitative treatment of interactive processes and the role of radiation. Some examples are given to indicate the potentialities of this technique when applied to atmospheric pollution problems. Forecasting models for studying the effect of the atmosphere on the distribution of pollutants are used to estimate continuous point source dispersion and the flow deformation of a cluster in a synoptic situation over Australia. Radiation is fundamental in considering the effect of pollutants on climate, and the complexities involved in assessing climatic change resulting from any local or global modification of the atmosphere indicate the need for a numerical model simulating the behavior of the complete ocean-atmosphere system on this time-scale in order to obtain an adequate assessment of the next result. (Author abstract modified)

32631 **APTIC NO. 54232**

Woodruff, R. K. and C. E. Elderkin

A COMPARISON OF MEASURED AND PREDICTED EXPOSURES FROM ELEVATED SOURCES. *In: Pacific Northwest Laboratory Annual Report For 1971 To The USAEC Division Of Biology And Medicine. Volume II: Physical Sciences. Part 1. Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1):1830, p. 110-114, Dec. 1972. 1 ref.*

NTIS: BNWL-1651 PT1, UC-53

A comparison has been made of data from elevated continuous source diffusion experiments with Pasquill estimates. The experiments were conducted in neutral and stable conditions, and the data were classified into stability classes by both the standard deviation of the azimuth angle and the Richardson number. The comparison indicates that estimates based upon Pasquill s curves are conservative downwind of the maximum in the ground level centerline exposure and unconservative at short distances. Hence, elevated plumes are growing faster than Pasquill s curves indicate, the latter being based primarily upon surface release experiments. The classification of the data by Richardson number gives a better stratification of the data than the azimuth angle classification, although the scatter in the data indicates that the stability stratification may not be significant. Better stratification of the data might be obtained if the Richardson number were used to classify the vertical diffusion and the azimuth angle used to classify the lateral diffusion. Crosswind integrated exposures classified with the Richardson number would also be expected to show better organization than if classified by azimuth angle since the lateral variance does not appear in the Gaussian model for crosswind integrated exposure. (Author abstract modified)

32632 **APTIC NO. 55196**

Yordanov, D.

SIMPLE APPROXIMATE FORMULAE FOR DETERMINING AND PREDICTING THE CONCENTRATION DISTRIBUTION FROM HIGH SOURCES. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 66-72. 12 refs. (May 15-18.)*

Vertical diffusion in the planetary boundary layer is investigated as a solution of the semi-empirical equation of diffusion. Blackadar s statement (1965) is adopted for the exchange coefficient for adiabatic layers, that of Zilitinkevitsch-Tschalikov (1968) for unstable stratification, and Tschalikov s (1968) for stable conditions. Simple, approximate formulas are proposed for the determination of the concentration leeward of a line and point source, and some comparisons are made with the data of Pasquill (1961) and Singer and Smith (1966). The practical possibility of predicting the pollution concentration patterns on the basis of the numerical weather forecast is discussed by applying the latest concepts of the structure of the planetary boundary layer. (Author abstract modified)

32633 **APTIC NO. 55148**

Zoran, Maria

SOME PHYSICAL ASPECTS OF AIR POLLUTION. *(Unele aspecte fizice ale poluarii aerului). Text in Rumanian. Stud. Cercet. Fiz., 24(3):369-385, 1972. 26 refs.*

The nature and properties of the principal air pollutants, the visibility and turbidity of the polluted atmosphere, and the effect of pollutants on the physical properties of the atmosphere are discussed. The pollutants discussed include carbon, sulfur, and nitrogen compounds. Visibility in a polluted atmosphere is lower due to diffusion and absorption of light radiation on the material suspension in the air. Atmospheric diffusion equations are discussed in detail. Absorption becomes a significant factor in visibility, especially in the case of colored fumes. Nitrogen dioxide is the most powerful absorbent in the blue green area of the visible spectrum, thus reducing visibility to a considerable degree. The meteorological factors affecting most urban atmosphere are discussed. Visibility and turbidity can be calculated mathematically. Smoke, dust, and other aerosols affect the generation of fog, clouds, and precipitation. In industrial centers, there is more fog by 100% and the rains are more frequent. Solar radiation intensity is limited by 30%, especially the ultraviolet region.

1971

32634 **APTIC NO. 54667**

Burlutskiy, R. F.

DUST DRIFT FROM AFRICA OVER THE ATLANTIC OCEAN IN THE SPRING OF 1970. *(O vynose pyli iz Afriki v Atlanticheskiy Okean vesnoy 1970 g.). Text in Russian. Tr. Gidrometeorol. Nauch.- Issled. Tsentr SSSR, no. 87:63-66, 1971. 1 ref.*

Dust drift from North Africa over the Atlantic Ocean was detected on photographs taken from a sputnik between April 20 and 24, 1970. The drifting dust appeared on the photographs in the form of distinct, spiral streaks of cyclonal curvature. The dust drift took place at a height over the trade-wind subinversional cloud layer, i.e., over 1.5 to 2 km.

32635 **APTIC NO. 55178**

Cohen, Ariel and Michael Graber

APPLICATION OF LASER TECHNIQUES TO INVESTIGATION OF CLOUDS AND PARTICLES IN THE ATMOSPHERE. APPENDIX: EXTREMA OF MIE INTENSITY FUNCTION AND DEPOLARIZATION FACTOR -- TABLES AND GRAPHS. (FINAL REPORT).

Hebrew Univ. of Jerusalem (Israel), Dept. of Meteorlogy, Environmental Science Services Administration Contract ESSA E-100-67(E), Contribution no. 71-18, 310p., Sept. 1971. 7 refs.

NTIS: COM-72 11468

Tables of the extrema of the Mie intensity function and depolarization factor for spherical water droplets are presented. The Mie intensity function i2 and depolarization factor were calculated in the range of O deg equal to or greater than theta equal to or greater than 180 deg for the scattering angle, and 1.4 equal to or greater than proportional to equal to or greater than 75.0 for the size parameter. The tables are supplemented with graphs. (Author abstract modified)

32636 **APTIC NO. 54689**

Shimazaki, Tatsuo

EFFECTIVE EDDY DIFFUSION COEFFICIENT AND ATMOSPHERIC COMPOSITION IN THE LOWER THERMOSPHERE. *J. Atmospheric Terrest. Phys., 33(9):1383-1401, Sept. 1971. 36 refs.*

Upper atmosphere theoretical considerations are presented for the effects of the profile of the effective eddy diffusion coefficient on the height variations in atomic oxygen, molecular oxygen, argon, and helium number densities. Many constituents are produced in the upper atmosphere due to photochemical reactions such as the photodissociation of O2 and recombination of O. Assuming various profiles of the eddy diffusion coefficient based on some theoretical and experimental evidence, the time dependent continuity equations have been solved, including transport terms by molecular and eddy diffusion as well as various chemical reactions. The results indicate that a maximum eddy diffusion coefficient of the order of 10 to the 7th power sq cm/sec in the height range of 95-105 km would explain most observations of the height variation in composition by rocket borne mass spectrometer, except for He, where the lateral flow of particles in ballistic trajectories in the exosphere may produce a large seasonal variation. The reduction of (O) is particularly pronounced when the eddy diffusion coefficient has a peak near 100 km. The local equilibrium is not maintained, but that the total production and loss for the atomic oxygen over a 24-hour period is almost in balance at each height. (Author abstract modified)

32637 **APTIC NO. 55074**

Slinn, W. G. and J. M. Hales

A REEVALUATION OF THE ROLE OF THERMOPHORESIS AS A MECHANISM OF IN- AND BELOW-CLOUD SCAVENGING. *J. Atmospheric Sci., 28(8):1465-1471, Nov. 1971. 14 refs.*

Thermophoresis, Brownian diffusion and diffusiophoresis are compared in the precipitation scavenging of aerosol particles. For a certain range of particles sizes, thermophoresis dominates, provided that the latent heat associated with the phase transition of water is transferred through the air, to or from the precipitation element by conduction. A plot of the resulting washout coefficient shows that thermophoresis enhances the below-cloud rain scavenging of aerosol particles whose radii are between 0.01 and 1.0 micron. The solution is presented for the appropriate convective diffusion equation which describes thermophoretic effects on the in-cloud scavenging problem. (Author abstract)

1970

32638 **APTIC NO. 55114**

Kapoor, R. K., G. L. Chugh, and Bh. V. Ramana Murty

DEACTIVATION OF THE ICE-FORMING AEROSOLS BY CHLORINE. *Indian J. Meteorol. Geophysics, 21(1):107-110, Jan. 1970. 13 refs.*

The effect of large concentrations of chlorine (approximately 1000 ppm which is six times higher than the concentration of chlorine gas in the atmosphere), on the nucleating efficiency of ice forming aerosols was investigated using a mixing type cloud chamber. The natural ice forming nuclei suffered deactivation in the presence of chlorine at -15, -20, and -25 C. On the average, the count of the effective ice nuclei was decreased by a factor of 5.3, 3.5, and 2.0 at 15, -20, and -25 C, respectively. There was a slight tendency for the deactivation of the ice forming nuclei to increase as a function of increasing chlorine concentration and ambient temperature. Chlorine is not an effective deactivator for use in weather modification studies.

32639 **APTIC NO. 54676**

Kepinski, J. and P. Kukula

ESTIMATION OF THE DUST LEVEL IN THE ATMOSPHERE AT QUAYS FOR HANDLING PHOSPHATE ROCK AND APATITES. *(Ocena zapylenia nabrzezy portowych przy przeladunkach fosforytow i apatytow). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(3):9-18, 1970. 3 refs.*

NTIS: TT 70-55124-3

The dust level in the atmosphere at Quays for handling phosphate rock and apatites were investigated for various meteorological conditions. Mass concentration of dust and number of particles per unit volume were determined at different distances from the pollution source. The concentration of phosphoric rock dust decreases with distance from the source more rapidly than the concentration of apatite dust. This is primarily due to the lower dispersion of phosphoric rock. Dust deposition was measured and the samples of dust and raw materials taken were subjected to fractional analysis. Dusts with diameters below 60 micron were fractionated by sedimentation, and the weight of the particular fractions was determined as to the size of the particles, the latter using a microscope provided with a micrometer screw. Apatite dusts contain more smaller particles than phosphoric rock dusts, and the 2 micron fraction constitutes 0.2% by weight in apatite, and 0.1% in phosphoric rock dust. The fraction with particle size below 10 micron amounts to about 3% by weight for apatites and 0.5% for phosphoric rock. (Author abstract modified)

32640 **APTIC NO. 54249**

Parczewski, W.

THE EFFECT OF ATMOSPHERE EQUILIBRIUM ON THE SPREADING OF ATMOSPHERE POLLUTANTS. *(Wplyw rownowagi atmosfery na rozprzestrzenienie sie zanieczyszczen przemyslowych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4(18)):43-49, 1970. 4 refs. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 1969.)*

NTIS: TT 7055124/4

The effect of weather conditions on the spreading of sulfur dioxide in the atmosphere surface layer was studied in areas adjacent to two major heating power plants. Continuous records of SO2 concentrations were obtained during both stable and labile equilibria. During the labile periods, the SO2 in the surface air layer exhibited instantaneous surges which occurred with reasonable regularity, reaching values of 0.3-0.8 mg/cu m. A stable equilibrium with a wind speed of 2-3 m/sec produced a more uniform average concentration of about 0.2 mg/cu m. When the wind speed was in excess of 4 m/sec, the average SO2 concentration was about 0.07 mg/cu m.

32641 **APTIC NO. 54260**

Wojciechowski, K.

THE INFLUENCE OF THE VERTICAL WIND PROFILE ON DUST DEPOSITION. *(Wplyw pionoewgo profilu wiatru na opad pylu). Air Conserv. (English translation* *from Polish of: Ochrona Powietrza), 4(3(17)):69-70, 1970. 14 refs.*

NTIS: TT 7055124/3

The formula for an axial dust deposition is given, taking into account the effect of the vertical wind profile within the framework of the so-called statistical theory. The results achieved were compared with the results obtained from the formulas of Sutton, Krieb, and those reached on the basis of the Bosanquet-Carey-Halton calculations. From the comparison, it appears that this formula given better results than the earlier three attempts, especially with regard to stable atmospheric conditions. (Author abstract modified)

1969

32642 **APTIC NO. 54256**

Glowiak, B., Kabsch, and J. Rutkowski

ESTIMATION OF PRECIPITATION OF DUST EMITTED FROM SOURCES WITH EMISSION CHANGING WITH TIME. *(Obliczanie opadu pylu emitowanego ze zrodel o emisji zmieniajacej sie w czasie). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(4(12)):47-54, 1969. 8 refs.*

NTIS: TT 7055123/4

Because all pollution sources are not invariable with time, it is necessary to incorporate the possible changeability of emission with time into the present formulas for the estimation of dust precipitation. The conversion coefficient presented here may be used in any procedure for estimating the precipitation of dust emitted by sources that are variable with time. Both types of formulas are demonstrated, and an example using the coefficient is given.

32643 **APTIC NO. 54259**

Kruczala, A.

AN ATTEMPT AT AN APPRAISAL OF THE EFFECT OF AIR POLLUTION ON THE RATE OF ATMOSPHERIC PRECIPITATION IN THE INDUSTRIAL DISTRICT OF UPPER SILESIA. *(Proba oceny wplywu zanieczyszczen powietrza na wielkosc opadow atmosferycznych w Gornoslakim Okregu Przemyslowym). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(4(12)):1-7, 1969. 13 refs.*

NTIS: TT 7055123/4

The effect of intensive industrialization and urbanization was studied on the meteorological conditions in the Upper Silesian Industrial District region. Industrially derived dust produces higher temperatures, a higher rainfall frequency, and a reduced snowfall frequency.

32644 **APTIC NO. 54670**

Shieh, Liau-Jang

A MULTIPLE-SOURCE MODEL OF TURBULENT DIFFUSION AND DISPERSION IN URBAN ATMOSPHERES. *New York Univ., N. Y., School of Engineering and Science, Thesis (Ph.D), Ann Arbor, Mich., Univ. Microfilms, Inc., Dec. 1969, 108p. 69 refs.*

A source-oriented three-dimensional model of diffusion and transport based upon the statistical concept of turbulent diffusion was constructed for an urban area. A simple mathematical algorithm was found for computing the concentration field from time-dependent continuous area sources of different scales. Point sources were treated separately. The model was specialized to take into account the specific meteorological conditions and the pollution source distribution characteristic of the metropolitan New York area. With slight modification, this model can be applied to any urban region. The validity of the model was checked by comparing the computed concentrations with observed values. The results were good over spacial scales of the order of 0.2 mi. (Author abstract modified)

1968

32645 **APTIC NO. 54747**

Berliand, M. E., R. I. Onikul, and G. V. Ryabova

ON THE THEORY OF ATMOSPHERIC DIFFUSION IN FOG CONDITIONS. *Tr. Gl. Geofiz. Observ. (Leningrad), no. 207:3-13, 1968. 15 refs. Translated from Russian. Air Force Cambridge Research Labs., Bedford, Mass., AFCRL-71-0268, 22p., March 25, 1971.*

NTIS, DDC: AD 724104

The harmful effect of smoke and gaseous mixtures is revealed more sharply in fog than in any other weather condition. Smog is the term used for the smoke-fog condition: A reverse effect was noticed when the presence of smoke contributed to the condensation of the atmospheric moisture. In this manner, a mutually increasing effect of smokes and fogs occurred. When calculating the effect of river fogs on the diffusion of admixtures from elevated sources, it was noted that the accumulation of admixtures by the fog from vapors up above increased the total concentration at levels located in the fog and decreased the gaseous admixture concentration above it. This presence of fog above the inversion layer shows that the admixture does not penetrate the inversion layer, even at great distances from the source, but is transferred in water drops, thus transforming them into a solution of harmful substances. These drops cause the phenomenon of acid rain. (Author abstract modified)

BASIC SCIENCE AND TECHNOLOGY

1973

32646 **APTIC NO. 54889**

Akimoto, H.

PHOTOCHEMICAL ATMOSPHERIC POLLUTION FROM THE FUNDAMENTAL CHEMICAL ASPECTS. *(Kiso kagaku kara mita kokagaku taiki osen gensho). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 26(9):548-549, Sept. 1973.*

The chemical bases of photochemical smog are reviewed. The photochemical problems of nitrogen oxides and hydrocarbons are discussed. The singlet state theory by Pitts was discarded because it gives too low a velocity for the reaction, and the chain reaction theory of Heicklen has replaced it. In this theory, the chain reaction of hydrogen dioxide, any oxide, and hydroxide radicals occurs, and the generated OH reacts with olefin to regenerate HO2 and RO2. The reaction of radicals containing oxygen in the vapor stage, and the reaction of hydrocarbons, involving toluene, xylene, and olefin is important. The dirty room effect prevents accurate data from a smog chamber.

32647 **APTIC NO. 54429**

Bachmaier, F., K. H. Eberius, and Th. Just

THE FORMATION OF NITRIC OXIDE AND THE DETECTION OF HCN IN PREMIXED HYDROCARBON-AIR FLAMES AT 1 ATMOSPHERE. *Combust. Sci. Technol., 7(2):77-84, 1973. 14 refs.*

The nitric oxide concentration profiles of premixed hydrocarbon air flames were measured using probe sampling and ultraviolet absorption of NO. The flames were stabilized on a Meker-type burner of 7 cm diameter at a pressure of 1 atm. Investigated fuels were i-octane, n-hexane, n-butane, propane, ethane, methane, gasoline, cyclohexane, benzene, acetylene, and ethylene. The measurements show the formation of NO according to the Zeldovich mechanism: at a rate constant of kl, oxygen (atom) + nitrogen (molecule) yields NO + N; at a rate constant of K2, N + O2 yields NO + O, with kl equaling 5 times 10 to the 13th power exp (-75400/RT) cu m/mol sec in fuel lean flames. In fuel-rich flames the NO formation due to the Zeldovich mechanism would require unreasonable high concentrations of O atoms, and evidence is given for another way of NO formation in these flames. Hydrogen cyanide is an intermediate species and exceeds the NO concentration in very fuel rich flames. (Author abstract)

32648 **APTIC NO. 54625**

Ball, M. J. and F. S. Larkin

DETERMINATION OF THE RATES OF ATOMIC REACTIONS BY THE DISCHARGE- FLOW METHOD. *Nature Phys. Sci., 245(143):63-64, Sept. 24, 1973. 17 refs.*

An operational technique of high precision and reliability for the determination of the rates of atomic reactions by the discharge flow method was developed. In principle the method is similar to that used by Clyne, McKenney, and Thrush, but differs chiefly in that large flows of M (all third bodies including oxygen atoms) are introduced downstream from the discharge for the accurate comparison of a wide range of third body efficiencies. The rate constants are currently 95% reliable to 50% or less. The effects of surface and other background reactions are eliminated, and the rate constants showed no trends with surface recombination efficiency which varied in the ranges 0.00004 to 0.00001. The method can distinguish between significant changes in surface recombination efficiency in the presence and absence of oxygen and such differences do not cause errors in the determination of kl,M. In the case of the most active surfaces, the introduction of O2 reduced the efficiency by surface poisoning. This effect may be responsible for the discrepancy between temperature coefficients as determined by flow methods and in a static system where surface recombination is negligible. The flow method can be used to study photochemical reactions in the atmosphere, including the reaction O + oxygen + M equals ozone + M.

32649 **APTIC NO. 54390**

Bandyopadhyay, P. K.

HEAT CONDUCTIVITY OF THE SYSTEM N2O4 IN EQUILIBRIUM WITH 2NO2 WITH DILUENTS. *J. Appl. Phys., 6(10):1283-1286, June 1973. 13 refs.*

The heat conductivity of the system nitrogen tetraoxide in equilbrium with 2NO2 with the diluents argon, nitrogen, and carbon dioxide was studied at 25 C and at pressures at which the reaction rates are available. Heat conductivity was measured by the thick wire variant of the hot wire method. The results show that the heat conductivity of the reacting system with Ar as the diluent can be explained satisfactorily in terms of the existing theories. However, for the systems with the diatomic and polyatomic diluents N2 and CO2, the heat conductivity is much lower than the calculated values obtained by considering relaxation of chemical energy. This discrepancy may be due to the effects of dipole quadrupole interactions between the components involved. (Author abstract modified)

32650 **APTIC NO. 55188**

Bowman, C. T., L. S. Cohen, and M. N. Director

NITRIC OXIDE FORMATION IN COMBUSTION PROCESSES WITH STRONG RECIRCULATION. (FINAL REPORT). *United Aircraft Research Labs., East Hartford, Conn., Environmental Protection Agency Contract 68-02-0252, EPA-R2-73-291, Program Element 1A2014, 145p., July 1973. 42 refs.*

NTIS: PB 223003

An investigation into the formation of nitric oxide in a premixed, turbulent flame stabilized on the recirculation zone downstream from a bluff-body undertaken. The objectives were to investigate the factors affecting NO formation in the recirculation zone and to assess the relative importance of NO production in the zone to overall NO production. The dependence of NO formation in the recirculation zone on the properties of the zone were determined. The NO production in the recirculation zone was strongly influenced by nonequilibrium chemical effects and by turbulent exchange processes. Information on turbulent exchange was obtained in a complementary investigation into recirculation zone fluid dynamics in nonreacting flows. Comparison of NO production in the recirculation zone with overall NO production indicates that, for the experimental configuration, the recirculation zone is not a major factor in overall NO production. An analytical model for NO production in the burner was developed. Results from this model suggest that the recirculation zone can be a major factor in NO production in practical combustion devices. (Author abstract modified)

32651 **APTIC NO. 54938**

Brus, L. E. and J. R. McDonald

COLLISION FREE, TIME RESOLVED FLUORESCENCE OF SO2 EXCITED NEAR 2900 A. *Chem. Phys. Letters (Amsterdam), 21(2):283-288, Aug. 15, 1973. 19 refs.*

A frequency doubled, tunable dye laser has been used to excite sulfur dioxide fluorescence in the region approximately 2600-3200 A. Two different groups of rovibronic states, having different zero pressure lifetimes and bimolecular quenching rates, are observed throughout the first excited singlet. The principal group of states has unusually long (approximately 80-600 microsec) collision free lifetimes, with bimolecular quenching rates and quenching rate an order of magnitude above gas kinetic, and has not been previously observed. A vibrational cascading nonexponentiality effect in the decay of the principal group has been confirmed. The unexpectedly long lifetimes and double exponential decay invalidates the previous conclusion that SO2 undergoes a unimolecular internal conversion. (Author abstract)

32652 **APTIC NO. 54762**

Buijtenen, C. J. P. van, J. Holland, and D. van Leeuwen

A NUMERICAL DIFFUSION MODEL FOR CONTINUOUS RELEASES. *Boundary- Layer Meteorol., 5(3):275-283, 1973. 5 refs.*

A diffusion model for a continuous point source was developed and compared with the results of short-ranged diffusion experiments. The model takes into account the increase in wind speed with height. The main problem in developing the model was to find a good expression for the vertical diffusion coefficient. Good agreement between theory and experimental results could be obtained only by introducing a settling speed W for the tracer combined with a conventional expression for the vertical diffusion (K(Z) equals K sub O Z to the (1-P) power). An emprical relation was found between Ko and tau sub v U and between W and sigma sub v U squared. (Author abstract modified)

32653 **APTIC NO. 54915**

Cehelnik, Edwin, Julian Heicklen, Silvia Braslavsky, Leonard Stockburger, III, and Eckart Mathias

PHOTOLYSIS OF SO2 IN THE PRESENCE OF FOREIGN GASES. IV. WAVELENGTH AND TEMPERATURE EFFECTS WITH CO. *J. Photochem., vol. 2:31-48, 1973/1974. 31 refs.*

Studies of the photolysis of sulfur dioxide in the presence of carbon monoxide were extended from 3130 A and 300 K to 2537 and 3261 A at 300 K and to 415 and 520 K at 3130 A. Experiments were also performed in the presence of either or both nitric oxide and nitrogen. The quantum yield for carbon dioxide formation, Phi(CO2), was independent of temperature and the absorbed intensity but showed a mild wavelength dependence. The Phi(CO2) was nearly independent of (SO2) and directly proportional to (CO) at high SO2 pressures and increased with decreasing (SO2) at lower SO2 pressures. The Phi(CO2) was markedly reduced by the addition of a large excess of N2 gave only a slight reduction in Phi(CO2). Further experimental evidence was provided for the non-emitting singlet and triplet states by fitting the results with a three electronic state model of two excited singlets (one emitting and one non-emitting) and the non-emitting triplet state. A set of rate constants was obtained which was consistent with all the spectroscopic data and satisfactorily fitted almost all of the 216 data points at 300 K as well as those at elevated temperatures. (Author abstract modified)

32654 **APTIC NO. 54370**

Cook, N. J.

ON SIMULATING THE LOWER THIRD OF THE URBAN ADIABATIC BOUNDARY LAYER IN A WIND TUNNEL. *Atmos. Environ., 7(7):691-705, July 1973. 11 refs.*

A method of simulating the urban adiabatic boundary layer is described which meets the conflicting requirements of model scale and wind tunnel size by representing only the lower third of the atmospheric boundary layer. Experimental measurements in 1/250 scale simulated flow are presented and agree well with full scale data. The simulation method gives very good representation of the lower third of the urban adiabatic atmospheric boundary layer. Use of the imaginary top of boundary layer height parameter H and velocity parameter UH is valid. Wind loading and wind environment studies of buildings and building complexes can be made using this method at scales large enough to reproduce detail in small, and therefore, economic wind tunnels. (Author abstract modified)

32655 **APTIC NO. 54937**

Copeland, T. G. and R. H. Cole

FAR INFRARED ABSORPTION AND QUADRUPOLE MOMENT OF NITROUS OXIDE. *Chem. Phys. Letters (Amsterdam), 21(2):289-290, Aug. 15, 1973. 8 refs.*

The far infrared absorption and quadrupole moment of nitrous oxide were determined. The effects of quadrupole interaction energy and use of consistent Lennard-Jones parameters give a quadrupole moment Q equals 4.05-4.6 (in units 10 to the -26th power esu) for N2O from measured integrated infrared intensity due to pair interactions. The figures are considerably smaller than Baise s original Q is approximately 8 and in much better agreement with Q equals 3.5 from birefringence. (Author abstract modified)

32656 **APTIC NO. 54415**

Counihan, J.

SIMULATION OF AN ADIABATIC URBAN BOUNDARY LAYER IN A WIND TUNNEL. *Atmos. Environ., 7(7):673-689, July 1973. 35 refs.*

The adiabatic boundary layer appropriate to flow over an idealized urban terrain was simulated using a modified version of the system previously used to produce a rural boundary layer simulation. Where possible, measurements in the simulated flow were compared with full scale measurements and reasonable agreement was obtained. However, because of a general lack of measurements in urban areas, several assumptions had to be made concerning the characteristics of some of the flow properties. It was assumed that the velocity profile can be represented by a power law and on the basis of the available data and the arguments put forward, an index of 0.28 was assumed to be the most representative choice, as was the associated value of the mean roughness length (i.e., 2.50 m). The characteristics of the simulated boundary layer were consistent with the interpretation of the available full scale measurements. (Author abstract modified)

32657 **APTIC NO. 54922**

Cox, R. A.

THE SULPHUR DIOXIDE PHOTOSENSITIZED CIS-TRANS ISOMERIZATION OF BUTENE-2. *J. Photochem., vol. 2:1-13, 1973/1974. 13 refs.*

The photosensitized cis-trans isomerization of butene-2 in the presence of sulfur dioxide excited within its first allowed absorption band was examined; and isomerization resulted primarily from the reaction of excited triplet SO2 molecules (3SO2) with butent-2, although there was some evidence for the reaction of excited singlet SO2 with cis-2-butene leading to isomerization. Quenching rate constants for 3SO2 with cis-butene-2 and trans-butene-2 relative to SO2 determined from measurements of the quantum yields for photosensitized isomerization at high (SO2)/(butene-2) ratios were 1.62 plus or minus 0.08 times to the 11th l/mol s for the cis isomer and 1.42 plus or minus 0.09 times 10 to the 11th l/mol s for the trans isomer based on the literature value of 3.9 times 10 to the 8th power l/mol s for the absolute rate constant for the reaction of 3SO2 with SO2. The fraction of trans isomer formed in the isomerization was 0.587 plus or minus 0.028. The cis-trans isomerization of butene-2 appears to provide a useful method for the determination of 3SO2 yields in SO2 photolysis in the first allowed absorption band; and at the pressure and wavelength used in the present study, the quantum yield for the production of 3SO2 molecules was 0.112 plus or minus 0.006. (Author abstract modified)

32658 **APTIC NO. 54523**

Delos, John B.

ON THE REACTIONS OF N2 WITH O. *J. Chem. Phys., 59(5):2365-2369, Sept. 1, 1973. 14 refs.*

Unimolecular decomposition of N2O, quenching of O(1D) by N2, and vibrational relaxation of N2 in the presence of O(3P) are all believed to occur by the same curve crossing mechanism. This mechanism is examined making use of a complete theory of curve crossings. Good agreement with experiment is found for the unimolecular decomposition rate. The simple curve crossing mechanism does not explain the observed O(1D) quenching rate; this rate must be due to complex formation and/or additional crossings. At high temperatures, the calculated vibrational relaxation time is in good agreement with experiment, but at low temperatures there is a serious, unexplained discrepancy. (Author abstract modified)

32659 **APTIC NO. 55081**

Dunkin, D. B., F. C. Fehsenfeld, and E. E. Ferguson

THERMAL ENERGY RATE CONSTANTS FOR THE REACTIONS NO2- + CL2 YIELDS CL2- + NO2, CL2- + NO2 YIELDS NO2CL, SH- + NO2 YIELDS NO2- + SH, SH- + CL2 YIELDS CL2- + SH, AND S- + NO2 YIELDS NO2- + S. *Chem. Phys. Letters (Amsterdam), 15(2):257-259, Aug. 1, 1973. 18 refs.*

The relative electron affinity of nitrogen dioxide and chlorine were determined. The charge transfer of NO2 with Cl2 is fast at thermal energy. The Cl2 ion reacts with NO2 to produce Cl and NO2Cl and SH(-) -1 ion charge transfers rapidly with both Cl2 and NO2. From the exthermicities implied it is deduced that EA (SH) is less than EA (NO2) is less than EA (Cl2) or EA (NO2) equals 2.38 + or 0.06 eV and EA (Cl2) equals 2.46 + or 0.14 eV. (Author abstract modified)

32660 **APTIC NO. 54392**

Dutton, J., F. M. Harris, and D. B. Hughes

ELECTRICAL BREAKDOWN OF NITROUS OXIDE. *Proc. Inst. Elec. Engrs. (London), 120(8):941-944, Aug. 1973. 24 refs.*

The electrical breakdown and dielectric strength of nitrous oxide was investigated. Measurements of the spatial growth of prebreakdown ionization currents and of the sparking potential (Vs) were performed within the range 145 times 10 to the -17th power is less than E/N is less than 175 times 10 to the -17th power V sq cm, where E is the electric field and N is the gas number density, which was in the range of 1.6 times 10 to the 18th power to 20 times 10 to the 18th power cu m. The breakdown strength is about half that of sulfurhexafluoride, Vs in any given curcumstances is dependent not only on the product

Nds (where ds is the sparking distance), but also on N. Analysis of the measurements of prebreakdown ionization currents shows that the explanation of this behavior lies primarily in the fact that the effective primary ionization coefficient is not linearly dependent on N, probably because of the occurrence of collisional detachment from NO ion which is formed in one of the many ion molecule reactions known to occur in N2O. (Author abstract)

32661 **APTIC NO. 54427**

Gardner, J. L., and J. A. R. Samson

PHOTOELECTRON SPECTROSCOPY OF NITRIC OXIDE BETWEEN THRESHOLD AND 972 A. *J. Electron Spectrosc. Relat. Phenomena., 2(2):153-160, 1973. 10 refs.*

A number of photoelectron spectra have been recorded from nitric oxide at discete lines in the wavelength region between threshold (1338 A) and 972 A. In this range, the ground chi 1-sigma(+) state of NO(+) is the only ionic state accessible. In the region above 1130 A, the vibrational intensity distribution within the chi 1-sigma(+) state agrees with that predicted by Franck-Condon factors from the ground state of neutral nitric oxide, but all spectra recorded between 1130 A and 972 A disagree with the Franck-Condon factors and show all energetically allowed vibrational levels populated. These spectra are discussed in relation to the published photoionization cross-section of nitric oxide in this wavelength range. In addition, the spin-orbit splitting of the ground state of neutral nitric oxide has been partially resolved in a spectrum recorded at 1216 A. The importance of using the exact solar line with the same broadening as in the sun to record photoelectron branching ratios of atmospheric gases at solar wavelength in the presence of autoionization, if these branching ratios are to be used as input data in evaluating atmospheric reactions is discussed. (Author abstract modified)

32662 **APTIC NO. 54951**

Gosavi, R. K., M. DeSorgo, H. E. Gunning, and O. P. Strausz

THE UV ABSORPTION SPECTRUM AND GEOMETRY OF THE HS2 RADICAL. *Chem. Phys. Letters (Amsterdam), 21(2):318-321, Aug. 15, 1973. 20 refs.*

The untraviolet absorption spectrum of the transient hydrogen sulfide radical produced in the flash photolysis of hydrogen disulfide was recorded. The spectrum observed in the lambda equals 3070-3800 angstrom region is assigned to the A sq A prime in reverse yields X sq A double prime electronic transition, and the three progressions to the sulfur-sulfur stretching (v prime 1), S-S-hydrogen bending (v prime 2) and S-H stretching (v prime 3) vibrations of the 2 A prime upper electronic state. Open shell CNDO/2 calculations were carried out to optimize the ground state (2 A double prime) molecular geometry. For comparison, similar calculations were also performed on the hydrogen dioxide radical. Hydrogen disulfide is bent in the ground state and nearly linear in the (2 A prime) and (4 A prime) excited states. (Author abstract)

32663 **APTIC NO. 54936**

Hales, Jeremy M. and Sue L. Sutter

SOLUBILITY OF SULFUR DIOXIDE IN WATER AT LOW CONCENTRATIONS. *Atmos. Environ., 7(10):997-1001, 1973. 8 refs.*

The solubility of low concentration sulfur dioxide in water was measured using a flow technique. Concentrations of SO2 in the gas phase ranged between 0.00178 and 0.1075 micromole/l. The temperature of the experiment was held constant at 25.1 C. The influence of acidity on solubility was examined by adding HCl to the water solutions, thereby modifying pH over the range between approximately 3 and 7. Experimental results agree well with values predicted on the basis of solubility theory used in conjunction with solubility and dissociation constants published previously. (Author abstract)

32664 **APTIC NO. 54581**

Hiby, Julius W.

TRANSPORT PHENOMENA IN FALLING FILMS. *(Transportvorgaenge in Rieselfilmen). Text in German. Chem-Ing.-Tech., 45(18):1103-1106, 1973. 22 refs. (Presented at the DECHEMA Tutzing-Symposium, 10th, March 12-15, 1973.)*

A short description is given of the different concepts for the transport mechanism in falling films. Experiments show the mass transfer coefficient to be proportional to the square root of the diffusion coefficient; this invalidates the two film-theory and supports the models with non-stationary diffusion. In the laminar region the wave-mixing model seems most likely. The following interfacial phenomena during the absorption of ammonia in diluted hydrochloric acid and of hydrogen chloride in diluted sodium lye were observed and investigated by use of fluorescent indicators: attenuation of waves by surface-active agents; marangoni- instability when highly soluble gases are absorbed. These phenomena affect the transport of mass more than that of heat or momentum.

32665 **APTIC NO. 54627**

Judeikis, Henry S. and Seymour Siegel

PARTICLE-CATALYZED OXIDATION OF ATMOSPHERIC POLLUTANTS. *Atmos. Environ., 7(6):619-631, June 1973. 51 refs.*

The extent of the occurrence in the atmosphere of heterogeneous processes involving gases such as carbon monoxide, nitrous oxide, sulfur dioxide, olefins, and nitric oxide is estimated. The appropriate conditions under which heterogeneous reactions can compete with homogeneous gas phase reactions in the generation or removal of gaseous air pollutants are determined by using a simplified kinetic model together with transition state theory and experimental activation energies to estimate absorption, desorption, and reaction rates. Under certain favorable conditions, surface catalyzed reactions in polluted atmospheres can realistically compete with and, in some cases, dominate the homogeneous gas phase reactions that are usually considered to be important. The critical factor in determining the contribution of particle catalyzed reactions is the difference between the activation energies for reaction and desorption of the adsorbed gas molecule. These reactions will become important for selected cases as this difference approaches O kcal/mole. Alternately, for adsorption or photocatalysis to be competitive with the homogeneous gas phase reactions, desorption must exceed approximately 15 kcal/mole. (Author abstract modified)

32666 **APTIC NO. 55179**

Knebel, William J. and Robert J. Angelici

MECHANISM OF CHELATE RING OPENING IN METAL CARBONYL COMPLEXES. *Preprint, Iowa State Univ., Ames, Dept. of Chemistry, 22p., 1973. 20 refs.*

The mechanism of chelate ring opening in metal carbonyl complexes was investigated. Carbon monoxide reacts with a series of M(CO)4(Phosphorus-Nitrogen) complexes, where M equals chromium, molybdenum, and tungsten and P-N is a donor bidentate ligand, to give the monocoordinated ligand complex: M(CO)4(P-N) + CO yields M(CO)5(P-N). The rate of the reaction is first order in CO concentration, but in the presence of a strong acid such as trifluoracetic acid the uncoordinated N donor is immediately protonated preventing reclosure (k-1) of the ring. Together with the rate data obtained in the absence of acid, the K1 value obtained in the acid reactions allows the calculation of the rate ratio (k-1/k2) for ring closure (k-1) to reaction with CO(K2). Values of k1 increase with the increasing bulkiness of the groups on the N-donor group of the ligand: (C6H5)2PCH2CH2NH2 is less than (C6H5)2PCH2CH2N(CH3)2 is less than (C6H5)2PCH2CH2N(C2H5)2. For 5 and 6- membered chelate complexes, k1 is much larger for the 6-membered Mo(CO)4((C6H5)2PCH2CH2CH2N(CH3)2) than for its 5-membered analog, Mo(CO)4(C6H5)2PCH2CH2N(CH3)2). Since the k-1/k2 ratios were observed to be very similar for all of the complexes examined, the overall rates of reaction are primarily determined by the rates of N-donor dissociation (k1). (Author abstract modified)

32667 **APTIC NO. 54218**

Lloyd, D. R. and P. J. Roberts

THE ASSIGNMENT OF THE PHOTOELECTRON SPECTRUM OF SULPHUR DIOXIDE. *Mol. Phys., 26(1):225-230, 1973. 11 refs.*

The photoelectron spectrum of sulfur dioxide was examined using a 20.3 cm radius hemispherical electrostatic deflector analyzer. The operating pressure was about 0.2/sq Nm. A single component reported at 16.73 eV was not located, but there is evidence for a third state in the band. The helium II spectrum was examined using a Perkins Elmer PS 18 spectrometer. The band envelopes in the He I spectrum and is normalized to the 12.3 eV band. The resolution is low because of the high electron energy and the wide slits necessary to obtain sufficient signal strength, so no fine structure is expected. A fourth band is detected with and adiabatic I. P. of 20.06 + or 0.05 eV (band onset), vertical I. P. 20.65 + or 0.03 eV, confirming that a fourth band does occur in the He I region. No further ionizations were detected before 28 eV. Although the I. P. of the six higher lying orbitals are predicted by the calculations to within 1.2 eV, even within these six the calculated spread of the orbitals is slightly higher than the experimental one, and the discrepancy is greater for the final band, assigned to ionization from 6a, calculated to appear at 23.25 eV. This calculation incorrectly predicted that 6a would have almost no bonding character, since the band is broad, the width at half height is approximately 0.7 eV, distinctly greater than that of the third band with three ionizations in the envelope.

32668 **APTIC NO. 54428**

Marsden, Michael J. and George R. Bird

RESONANCE RAMAN SPECTRUM OF GASEOUS NITROGEN DIOXIDE (NO2). *J. Chem. Phys., 59(5):2766-2767, Sept. 1, 1973. 8 refs.*

The Raman spectrum of nitrogen dioxide is observed and identified, and then separated from the intermingled fluorescent lines. At relatively high pressures (200-600 mm Hg at 25 C) the fluorescence and Raman spectra are seen at about equal intensity. Whatever symmetry relationship exists between the ground state and the virtual excited state, it is always possible to have operative the selection rule delta J equals O, delta K equals O, for the pure rotational Raman spectrum and for the vibrational transitions which do not alter the symmetry of the molecules. Since nitrogen dioxide is a very nearly prolate top, the appropriate AST quantum number is K1(-). For a heavier molecule, these selection rules would produce a single broad Raman envelope for all values of J and K, but in the case of NO2, the least moment of inertia changes approximately 4.3% for one quantum of bending excitation, and 9.2% for two quanta. Thus the spectrum following delta J equals delta K equals O separates into subclusters for the different K1(-) values. To separate the overlapping fluorescence and Raman lines, it is only necessary to run several Raman spectra with different excitation lines. A Carey Model 82 Raman spectrograph with an argon laser is used, and the 514 and 488 nm lines with powers of 200-300 mW are excited.

32669 **APTIC NO. 54651**

Masuda, Isao

NITROGEN OXIDES PRODUCTION AND THEIR CHEMICAL PROPERTIES. *(Chisso sankabutsu no hassei to kagakuteki seishitsu). Text in Japanese. Preprint, Research Group of Environmental Techniques of Japan, Osaka, p. 5-22, 1973. (Presented at the Seminar on Environmental Techniques, Osaka, Japan, May 16-17, 1973.)*

The production and chemical reactions of nitrogen oxides are discussed. The electronic structure of nitric oxide is described to explain its high reactivity and paramagnetism. Complexes which include NO include halogenated nitrosyl, nitrosonium complexes, nitronium complexes, transition metal nitrosyls, cyano nitrosyl complexes, and cobalt and iron complexes combined with NO. Interaction of NOx and hemoglobin is discussed.

32670 **APTIC NO. 55010**

Milnes, Dale J. and Joseph D. Henry

OPTIMUM PRODUCTION OF ATOMIC OXYGEN FOR USE IN ANALYTICAL TECHNOLOGY. *Ozone Research and Equipment Corp., Phoenix, Ariz., Environmental Protection Agency Contract 68-02-0558, Program Element 1a1010, EPA-R2-73-197, 20p., March 1973. 21 refs.*

NTIS: PB 221178

An investigation was undertaken to determine the feasibility of generating atomic oxygen by chemically induced catalytic decomposition of ozone at near ambient temperatures. Candidate chemicals identified through a literature survey included molecular sieve, hopcalite, silica gel, activated charcoal, soda lime, nickel, iron oxide, manganese dioxide, sodium hydroxide, calcium metasilicate, sodium metasilicate, and vanadium pentoxide. Tests with these chemicals were conducted at 75-380 F, ozone flow of 11 cu cm/min, and nitrogen dioxide flow (100 ppm NO2 in argon) of 0-28 cu cm/min. In no case was the generation of atomic oxygen sensed by the photometer. The reaction of oxygen atoms to combine as oxygen molecules proceeds to the exclusion of atomic oxygen reactions with nitrogen oxides at ambient temperatures.

32671 **APTIC NO. 54426**

Myers, B. F.

TEMPERATURE DEPENDENCE FOR DISSOCIATIVE RECOMBINATION OF NO+ IN E- AND F-REGION MODELS. *J. Atmospheric Terrest. Phys., 35(10):1903-1904, Oct. 1973. 15 refs.*

The temperature dependence for the dissociative recombination of NO+ customarily used in E and F-region models is discussed. On the basis of present experimental and theoretical evidence, these temperature dependencies are incorrect for temperatures to be encountered in the E and F-regions. The appropriate temperature dependence of the rate coefficient should be that for the dissociative recombination of NO+ which is essentially in the ground vibrational state. Although the temperatures in the E and F-regions correspond only to a small degree of vibrational excitation of NO+ under the assumption of equilibration of energy modes, this is not a sufficient basis for the preceding recommendation. The product NO+ may be formed with energy in the vibrational mode much in excess of that corresponding to E and F-region temperature. For reactions with a smaller rate coefficient, 75% or more of the available energy (reaction exothermicity, vibrational energy of nitrogen, and relative kinetic energy of reactants) may be transferred to internal modes of NO+. The temperature dependence which should be used in the E and F-region models needs to be established. The use of a T to the -1/2 power dependence indicated by theory could be used in the interim.

32672 **APTIC NO. 54912**

Naccache, Claude and Younes Ben Taarit

NATURE OF NITRIC OXIDE AND NITROGEN DIOXIDE ADSORBED ON CHROMIUM AND NICKEL EXCHANGED ZEOLITES. *J. Chem. Soc., 69(8): 1475-1486, 1973. 27 refs.*

The forms of nitric oxide and nitrogen dioxide adsorbed on chromium and nickel exchanged zeolites were investigated. Chromic ion exchanged zeolites can be either oxidized to Cr(+)5 ion by oxygen, or reduced by hydrogen or carbon monoxide to a lower valence state of chromous ion. Electron spin resonance measurements showed the formation of a 3d to the 5th power nitrous ion complex upon adsorption of nitrous oxide on reduced Cr samples. This complex has a Cr(+)NO(+) structure and infrared spectroscopy provided evidence of the formation of the nitrosyl complex. Under certain conditions a diamagnetic complex Cr2(NO)4 was also formed. Adsorption of NO2 gave rise to the 3d to the 5th power complex Cr(+)NO2(+). Similarly NO and NO2 adsorb on Ni ion exchanged zeolites to form 3d to the 9th power complexes. Simultaneously, at high pressures NO adsorbs irreversibly on Na(+) ions of either the exchanged Y zeolites or even the unexchanged NaY. Nitrous oxide adsorption could also be used as a rough but easy means to locate the exchanged cations and to show cation migration from hidden sites toward accessible ones. The behavior of the zeolite framework as a polar solvent, and its probable role in the stabilization phenomenon of some cations in rather unusual valence states, is emphasized. (Author abstract modified)

32673 **APTIC NO. 54718**

Nozhevnikova, A. N. and G. A. Zavarzin

SYMBIOTIC OXIDATION OF CARBON OXIDE BY BACTERIA. *(Simbioticheskoye okisleniye okisi ugleroda bakteriyami). Text in Russian. Mikrobiologiya, 42(1):158-159, 1973. 8 refs.*

Two-component bacterial system, capable of the symbiotic oxidation of carbon monoxide into carbon dioxide, was detected in soil samples taken in Moscow city. The bacterial growth in a CO atmosphere was stimulated by vitamin B12, biotin, riboflavin, thiamine, pyridoxine, paraaminobenzoic acid, pantothenic acid, nicotinic acid, and folic acid. The mechanism of interaction of the CO-oxidizing, two-component microbial system in a natural environment is most possibly based upon the mutual vitamin supply. The bacteria pertain to different morphological groups. The auxoautotrophic strains Z-1107 and Z-1171 cause autotrophic growth on sugars, strain Z-1171 resembles Achromobacter guttatus. The vitamin-dependent strains exploit sugar poorly, strain Z-1155 resembles Vibrio percolans, while strain Z-1156 is close to Hydrogenomonas facilis. The failure of the atmospheric CO concentration to increase despite increasing CO output may be due to the action of such CO-oxidizing bacteria.

32674 **APTIC NO. 54414**

Otto, K., and M. Shelef

STUDIES OF SURFACE REACTIONS OF NO BY ISOTOPE LABELING. VI. THE REDUCTION OF NITRIC OXIDE BY AMMONIA AND HYDROGEN OVER SUPPORTED RUTHENIUM. *Z. Physik. Chem. Neue Folge (Frankfurt), vol. 85:308-322, 1973. 12 refs.*

Ruthenium catalysts form less ammonia than other catalysts in the reduction of nitric oxide by hydrogen-containing reducing agents. Comparative measurements of the rates of NO reduction by NH3 and H2 over a Ru catalyst were made to show the path of N atoms from NO to molecular N. The apparent activation energies of NO reduction by H2 and NH3 were 11.3 and 29.3 kcal/mol, respectively. At approximately 230 C, the rate of reduction by NH3 overtakes that by H2. The mechanism of the (14)NO-(15)NH3 surface reaction on Ru, judging from the product distribution, is analogous to that previously derived for Pt and Cu surfaces. In the lower temperature range, the surface reaction steps governing the NO-NH3 reaction are an important path in the formation of molecular N2 or NO from N2 in the reduction of NO by hydrogen. As the temperature increases, the pairing of N-atoms over Ru is expected to follow the surface steps governing ammonia NH3 decomposition. (Author abstract modified)

32675 **APTIC NO. 54400**

Quan, V., C. A. Bodeen, and D. P. Teixeira

NITRIC OXIDE FORMATION IN RECIRCULATING FLOWS. *Combust. Sci. Technol., 7(2):65-75, 1973. 6 refs.*

Nitric oxide generation rate and concentration distribution in combustors containing regions of recirculating flow are calculated using a computer program developed for two dimensional elliptic compressible flows. Two special techniques were incorporated in the computer program to evaluate NO. One is the flame finding procedure by which the peak temperature lines, near which most of the NO is formed and which generally straddle the grid points of a numerical network, are located by double interpolation through local enthalpy and fuel air composition. The other is the evaluation of NO formation in a grid volume by considering the temperature variations as well as the average temperature in the volume element. The chemical compositions, except NO, are assumed to be at local equilibrium. Methane air equilibrium combustion tables, relating temperature and chemical species such as water vapor, carbon dioxide, and molecular oxygen to fuel/air ratio and enthalpy are employed. Sample results for the profiles of stream function, swirl velocity, fuel mass fraction, temperature, NO formation rate, and No concentration are presented. (Author abstract)

32676 **APTIC NO. 54344**

Rebbert, R. E., S. G. Lias, and P. Ausloos

PULSE RADIOLYSIS OF METHANE. *J. Res. Natl. Bur. Std. A, 77A(2):249-257, April 1973. 36 refs.*

The pulse radiolysis of methane was studied in the absence and presence of electron scavengers such as sulfur hexafluoride and deuterated methyl iodide, as well as positive ion scavengers such as deuterated iso-butane in order to define the role of intermediates H, C, CH, CH2, CH3, CH5+, and C2H5+ in product formation. The dose rate was varied from 0.68 to 15.2 times 10 to the 19 eV/g-s, the dose (number of pulses) was varied, and the duration of the pulse was changed from 3 ns to 100 ns. Variation in the yields of ethylene and ethane products with dose is explanable by the reaction of H atoms with accumulated ethylene product. The fast reacting C, CH, and 1CH2 species were inserted into methane to form acetylene, ethylene, and ethane products; but all of the reactions of these species could not be completely specified since they may originate in upper electronic states whose reactions with methane are unknown. Product formation by the slow reacting 3CH2 and CH3 species was also examined, and evidence is presented for the formation of ethene and a hydrogen atom from the two as reactants. Results indicate that the ions CH5+ and C2H5+ undergo neutralization mainly through the process: CH5+ plus an electron gives methane and a hydrogen atom, while C2H5+ plus an electron gives the intermediate (C2H4) plus a hydrogen atom which in turn give acetylene plus a hydrogen atom plus hydrogen, H2(2H). Addition of deuterated iso-butane causes a fraction of the ions CH5+ and C2H5+ to react with the additive rather than to undergo neutralization. A calculation demonstrates that the fraction of ions undergoing reaction with a given concentration of deuterated iso-butane can be correctly predicted by assuming that the rate constant for neutralization of the two ions is the same as that determined recently for the t-butyl ion. (Author abstract modified)

32677 **APTIC NO. 54935**

Skancke, P. N. and James E. Boggs

A THEORETICAL STUDY OF THE STRUCTURE OF (NO)2. *Chem. Phys. Letters (Amsterdam), 21(2):316-317, Aug. 15, 1973. 10 refs.*

A theoretical study of the structure of the nitric oxide dimer, (NO)2 is presented. Ab initio SCF calculations on the cis form of (NO)2 indicate that the nitrogen-nitrogen bond distance is 1.74 A, the nitrogen-oxygen bond distance is 1.16 A, and the angle N-N-O is 107 degrees. (Author abstract modified)

32678 **APTIC NO. 54904**

Stockburger, Leonard, III, Silvia Braslavsky, and Julian Heicklen

PHOTOLYSIS OF SO2 IN THE PRESENCE OF FOREIGN GASES. III. QUENCHING OF EMISSION BY FOREIGN GASES. *J. Photochem., vol. 2:15-29, 1973/1974. 16 refs.*

A study of the photolysis of sulfur dioxide in the presence of foreign gases was conducted for the purpose of extending the quenching gas pressure range beyond that used previously to determine if deviations would occur from the Stern-Volmer quenching plots. Emission yields of SO2 at 2.0 torr pressure were measured in the presence of nitric oxide, carbon dioxide, carbon monoxide, nitrogen, oxygen, nitrous oxide, steam, carboxysulfide, and thiophene at 25 C with incident ratiation at 3130 A. Experiments were performed with and without 0.33 torr of NO present in order to measure the total and singlet relative emission efficiencies. Deviations from the Stern-Volmer plots did occur for the emitting singlet state, 1SO2, but not for the emitting triplet state, 3SO2. Singlet state SO2 is concluded to be neither the state initially produced when the radiation is absorbed nor the exclusive precursor state to triplet SO2 formation. Relative quenching constants obtained for the singlet and triplet emitting states agree well with previous work. No excess 3SO2 was produced over that predicted from Stern-Volmer quenching. (Author abstract modified)

32679 **APTIC NO. 54949**

Takashima, Tsutomu

EMERGENT RADIATION FROM AN INHOMOGENEOUS, PLANE-PARALLEL PLANETARY ATMOSPHERE CALCULATED BY USING THE ADDING METHOD. *J. Quant. Spectro. Radiative Transfer, 13(11):1229-1232, 1973. 8 refs.*

The method of computation of diffuse reflection radiation from an inhomogeneous, plane parallel planetary atmosphere is discussed by using the adding method. If the atmosphere is simulated by a number of homogeneous sublayers, the diffusely reflected radiation from the atmosphere can be expressed in terms of the reflection and the transmission matrices of radiation of sublayers. This method can be easily extended to the problem including aerosol distribution with height variation. Polarization is also included. If the diffuse reflection and the diffuse transmission matrices of radiation of individual homogeneous layers are known, the emergent radiation can be computed in terms of these matrices numerically. The diffuse reflection radiation through the entire atmosphere can be obtained by using one equation over and over again. When the atmosphere, including the aerosol distribution with height, is simulated by small numbers of homogeneous layers, the emergent radiation can be computed economically by this method. (Author abstract modified)

32680 **APTIC NO. 54626**

Tartarelli, R., M. Giorgini, P. Davini, and P. F. Marconi

CATALYTIC OXIDATION OF SO2 ON A CARBONACEOUS MATERIAL. *Riv. Combust. (Milan), 27(4-5):271-277, April-May 1973. 52 refs. (Presented at the Italian Flame Day, Pisa, Italy, March 20-21, 1973.)*

The catalytic oxidation of sulfur dioxide in a gaseous stream of nitrogen-oxygen-SO2 mixtures on a carbonaceous material produced by the combustion of fuel oil was investigated at atmospheric pressure in the temperature range of 280-320 C. A rapid increase in SO2 conversion results at relatively low values of the contact time, and after conversions of 3-5% a fast decrease in the reaction rate follows. This behavior cannot be ascribed to the reaction thermodynamics, in that the conditions at the outlet of reaction are quite far from the equilibrium. The drop in the reaction rate, which happens at very low values of SO2 conversion, is attributed to a product inhibition by SO3, which, being strongly adsorbed on the catalyst, remarkably reduces the number of centers active for reaction. A reaction rate model, in agreement with the experimental data, was built according to the Langmuir Hinshelwood mechanism with the assumption that the rate determining step is the surface reaction between atomically adsorbed oxygen and molecularly adsorbed SO2. (Author conclusions modified)

32681 **APTIC NO. 54771**

Thomas, Samuel G., Jr. and William A. Guillory

CONDENSED-PHASE PHOTOCHEMISTRY OF FORMALDEHYDE. *J. Phys. Chem., 77(20):2469-2473, Sept. 1973. 26 refs.*

The ultraviolet and vacuum-ultraviolet photolyses of formaldehyde and CD2O in argon, carbon monoxide, and CO-doped argon matrices were performed between 8 and 10 K. Infrared spectra of results are presented. The photodecomposition mechanism of CH2O is a function of photon energy. The major products of photolysis are CO, hydrogen, HCO and H, which presumably result from two primary processes. No infrared detectable products were observed as a result of photolysis with a medium pressure mercury lamp from exciting wavelengths above 3000 A. Photolysis into the continuum between 3000 A and the air cutoff (1780 A), with major lines at 2654 and 2537 A, resulted solely in the production of CO. Similar results were obtained from excitation into one of the Rydberg states with a hydrogen resonance lamp at 1215 A. Thus it appears that reaction I (CH2O + hv forming H2 and CO) is the major primary photodissociative process occurring in these wavelength regions. Based on relative intensities, more CO than HCO was obtained from photolysis at 1634 A. It again appears that reaction II is the major primary photodissociative process occurring, although the possibility of secondary photolysis also exists (HCO forming H and CO). (Author abstract modified)

32682 **APTIC NO. 54504**

Trouwborst, T. and J. C. de Jong

INTERACTION OF SOME FACTORS IN THE MECHANISM OF INACTIVATION OF BACTERIOPHAGE MS2 IN AEROSOLS. *Appl. Microbiol., 26(3):252-257, Sept. 1973. 23 refs.*

The mechanisms involving the inactivation of bacteriophage MS2 in aerosols and the effect of protective substances in the spray medium were studied after spraying from various sodium chloride solutions. The results with aerosols generated from the salt solutions showed that with higher salt concentrations in the spray medium, higher concentrations of protective substances were needed to protect phage MS2 against aerosol inactivation. Phenylalanine, which has a protective action at low concentrations, afforded less protection in aerosol droplets that were supersaturated solutions of this substance or in which crystals or phenylalanine can be expected to form. Protection by peptone and phenylalanine was related to the concentration in the aerosol droplet after evaporation to equilibrium, wheras protection by the surface active agent OED (a commercial mixture of oxyethylene docosylether and oxyethylene octadecylether) was related to the concentration at which a monolayer is formed around the aerosol particle. The inactivation of phage MS2 was maximal in the aerosol particle in fluid phase and became less at lower relative humidity, where aerosol particles are expected to be in the solid state. The inactivation of bacteriophase MS2 in aerosols might be explained by surface inactivation at the air-water surface. (Author abstract)

32683 **APTIC NO. 54955**

Williams, D. J.

THE EFFECT OF DIFFERENT GASES ON THE INTENSITY OF THE AIR AFTER-GLOW. *Australian J. Chem., 26(8):1837-1840, 1973. 7 refs.*

The intensities of chemiluminescence emitted by constant amounts of oxygen atoms and nitric oxide in the presence of various carrier gases flowing along a fast flow tube at a pressure of a few torr were investigated. The gases were hydrogen helium, nitrogen, O2, argon, methane, carbon dioxide, nitrous oxide, and sulfur tetrafluoride. The intensity of the afterglow was measured at 4500, 5000, 5500, and 6000 Angstroms, 8 cm downstream of the orifice. Absolute atom concentrations, determined by nitrogen dioxide titration, were in the region of 10 to the -11 power g-atom/cu cm. Oxygen atom decay between the orifice and the observation point was negligibly small. Measured light intensities were adjusted for any small (greater than 5%) deviations in the values of the pressure and flow rate from those existing for Ar. The results are interpreted in terms of the combined effects of the collision partner on vibrational stabilization and electronic quenching of the emitting molecule. (Author abstract modified)

1972

32684 **APTIC NO. 54786**

Adam, Waldemar and Ju-Chao Liu

SINGLET OXYGEN ADDITION TO THIOETHYLENES. *Chem. Commun., no. 2:73-74, 1972. 8 refs.*

Preliminary results on the photooxidation of di- and tetra- substituted ethylenes indicate that singlet molecular oxygen adds to dithio and tetrathio-ethylenes to form unstable 1,2- dioxetans which cleave into carbonyl products. Methylene chloride solutions of dithioethylenes prepared by the addition of 2-lithio-2-trimethyl-silyl-1,3-dithian to the respective ketones were treated at minus 78 C with singlet oxygen generated photochemically from triplet molecular oxygen by dinaphthylthiophen sensitization. Monitoring of the reaction mixture by thin layer chromatography, infra-red, and nuclear magnetic resonance showed the consumption of singlet oxygen by the dithioethylenes. Work-up of the reaction mixtures by column chromatography gave as major products ketones and 2-oxo-1,3-dithian. Some photooxidation on sulfur occurred as a side reaction. The relative ease of photooxidation for the tetrathioethylenes prepared under similar conditions by triethylphosphite coupling of the respective trithiocarbonates was such that the alkylthio went faster than the arylthio; this is in agreement with the electrophilic nature of singlet oxygen. Both the dithioethylenes and the tetrathioethylenes were stable towards the photolysis conditions in the absence of molecular oxygen and towards molecular oxygen in the dark. Column chromatography of the tetrathioethylene reaction mixture afforded dithio-oxalates and disulfides as the major products.

32685 **APTIC NO. 54981**

Aris, R. and K. H. Keller

ASYMMERTRIES GENERATED BY DIFFUSION AND REACTION, AND THEIR BEARING ON ACTIVE TRANSPORT THROUGH MEMBRANES. *Proc. Natl. Acad. Sci. U. S., 69(4):777-779, April 1972. 13 refs.*

An active transport model for biological membranes dealing with a class of problems related to simultaneous diffusion and reaction is proposed which suggests that a natural, stable asymmetry may arise on either side of a membrane, even when the bulk conditions on either side of the membrane are the same and the two faces of the membrane are indistinguishable. Equations are derived on the basis of Michaelis-Menten kinetics with substrate inhibition. The actively transported solute is not the substance that is reacting asymmetrically at the two membrane faces; and because the model for the development of the asymmetry does not fix the nature of the transport coupling, it is consistent both with those theories that postulate vectorial chemical reaction within the membrane and those that rely on more conventional membrane diffusion phenomena. Although the proposed model is not adequate by itself to explain all of the characteristics of any one active transport system, it does nevertheless suggest the importance of considering the dynamic balance between surface reactions and transport to (or from) the membrane surfaces to assess the origins of steady-state asymmetries in membrane behavior.

32686 **APTIC NO. 54703**

Barrett, R. V.

TECHNICAL NOTE--A VERSATILE COMPACT WIND TUNNEL FOR INDUSTRIAL AERODYNAMICS. *Atmos. Environ., 6(7):491-498, July 1972. 4 refs.*

A wind tunnel of compact closed circuit configuration designed specifically for industrial aerodynamics is powered by a 60 kW hydraulic drive system, employs contra-rotating fans, and contains a multi-cell diffuser. The tunnel has a working section 2 m wide by 1 m high by 6.5 m long with a maximum wind speed of 18 m/sec under typical operating conditions, and a secondary high speed working section 0.5 m wide by 1 m high by 1.75 m long. A flow processing section upstream of the main working section is designed to accommodate a number of plug-in devices for simulating natural wind conditions of turbulence and velocity gradient and will accept such units in rectangular ring frames with widths ranging from 20-50 cm. A typical arrangement designed to simulate an urban center wind condition at 1:250 scale includes a grid to produce a turbulence scale of about 10 cm and a longitudinal turbulence intensity of about 10% in conjunction with an upstream barrier and representative roughness ahead of the model which together establish the required velocity profile near the surface. The uniformity of velocity and level of turbulence in the main working section are compromised somewhat by the compact design but are sufficient for many industrial aerodynamic problems where simulated natural wind conditions are required rather than an aerodynamically smooth flow. The current estimated total cost for manufacture in Britain is about $20,000.

32687 **APTIC NO. 54482**

Beveridge, G. S. and D. P. Haughey

AXIAL HEAT TRANSFER IN PACKED BEDS. GAS FLOW THROUGH BEDS BETWEEN 20 AND 650 C. *Intern. J. Heat Mass Transfer, 15(5):953-968, May 1972. 34 refs.*

Analysis of the contribution of conduction, radiation, and convection to heat transfer within a two-phase packed bed system is extended to the case of gas flow through the bed. Temperature profile measurements are given for cocurrent gas and axial heat flows through the bed over a temperature range 20-650 C and a particle Reynolds number up to five. These results are analyzed in terms of both a continuous (diffusion) model and a new discrete (mixing cell) model. The latter provides more quantitative information on the heat transfer mechanisms involved since, unlike the former, separate account is taken of solid conduction-radiation, solid contact resistance, as well as solid-gas convection and bulk gas flow convection. The suitability of the discrete model is verified by comparison with both the present experimental cocurrent results at low and high temperatures and with previously published countercurrent low temperature measurements using a range of packing materials. (Author abstract modified)

32688 **APTIC NO. 54829**

Boland, D. and D. Geldart

ELECTROSTATIC CHARGING IN GAS FLUIDISED BEDS. *Powder Technol. (Amsterdam), 5(5):289-297, 1971/1972. 30 refs.*

An assessment of electrostatic charging in fluidized systems leads to the conclusion that electrostatic charges can produce interparticle attractions of such magnitude that the hydrodynamics of the system are affected. Further, most charge is generated in the region of intense particle activity around the perimeter of rising bubbles. Particles in the wake region are particularly active in promoting charging. The amount of charge generated increases with mean particle size, and this is attributed to the greater interparticle contact and lower bed voidages experienced as particle size increases. For the case of 2-D bubbles, particle-wall attractions are strongest for the finest particles present in the system. This explains the characteristic white streaks left by bubbles in a mixture of coarse blue particles and fine white particles. Fluidization with air of 60 to 70% relative humidity does not affect charge generation, but does cause more rapid dissipation due to the sharp decrease in bed resistivity which was found to occur around 60% relative humidity. (Author summary modified)

32689 **APTIC NO. 54255**

Brenner, Howard

SUSPENSION RHEOLOGY IN THE PRESENCE OF ROTARY BROWNIAN MOTION AND EXTERNAL COUPLES: ELONGATIONAL FLOW OF DILUTE SUSPENSIONS. *Chem. Eng. Sci., 27(5):1069-1107, May 1972. 56 refs.*

A general dynamic theory is presented for the rheological properties of dilute suspensions of rigid particles of arbitrary shape dispersed in a Newtonian fluid, including rotary Brownian motion and external couples acting upon the suspended particles. Utilization of the theory for particles of specified shape requires knowledge of eight fundamental tensors that are intrinsic geometric properties of the external (i.e., wetted) surface of the particles. The forms of these basic tensors can be deduced via group-theoretical arguments for particles of specified geometrical shape; and these eight tensors are explicitly given for general triaxial ellipsoidal particles and for spherical dumbbells, with the rheological behavior of suspensions of spheroidal and dumbbell particles in uniaxial, elongational, and compressive flows being calculated. Exact solutions of these problems are presented, and fundamental errors in prior works are noted. (Author abstract modified)

32690 **APTIC NO. 54793**

Brus, L. E. and M. C. Lin

CHEMICAL LASERS PRODUCED FROM 0(1D)ATOM REACTIONS. V. CARBON MONOXIDE STIMULATED EMISSION FROM FLASH-INITIATED 03 PLUS XCN SYSTEMS. *J. Phys. Chem., 76(10):1429-1433, 1972. 21 refs.*

Carbon monoxide infrared stimulated chemical laser emission was observed from the flash-initiated reaction of ozone and cyanides (XCN), where X is iodide, bromide, chloride, and cyanide, in mixtures with sulfur hexafluoride diluent. Approximately 60 P(J) lines of vibrational transitions from 13-12 down to 5-4 were present, and dilution in SF6 was essential for stimulated emission. Trial of the rare gas diluents helium, argon, and xenon resulted in anomalous effects due to the gases directly affecting the laser pumping mechanism. Mass spectrometric analysis showed an approximately 20% conversion of XCN per flash due to attack by 0(1D) atoms from ozone photolysis; only as estimated 0.1% of the XCN in the lasing mixture is dissociated during flash photolysis. No stimulated emission occurred during flash photolysis where X was Br or CN. The reaction scheme is provided for the vibrationally excited carbon monoxide species. (Author abstract modified)

32691 **APTIC NO. 55022**

Chakrabarti, Gautam and Chieh Chu

REDUCTION OF NITRIC OXIDE WITH AMMONIA ON COPPE CHROMITE AND NICKEL-COPPER OXIDE CATALYSTS. *Atmos. Environ., 6(5):297-307, 1972. 6 refs.*

Catalytic reduction of nitric oxide with ammonia was studied by use of Girdler s G-22 (barium promoted copper chromite) and T-312 (nickel oxide and copper oxide on gamma alumina) catalysts inside a Carberry type stirred tank reactor. Helium was used as the carrier gas. The nitric oxide and ammonia concentrations in the feed varied from 550 to 1400 ppm and 700 to 7900 ppm, respectively. Temperature levels were from 177 to 316 C. Gas flow rates ranged from 200 to 300 l/hr. Empirical kinetic expressions for both catalysts were developed which adequately represent the experimental results. (Author abstract)

32692 **APTIC NO. 54445**

Curl, R. F., Jr., K. M. Evenson, and J. S. Wells

LASER MAGNETIC RESONANCE SPECTRUM OF NO2 AT 337 MICRON AND 311 MICRON. *J. Chem. Phys., 56(10):5143-5151, May 15, 1972. 20 refs.*

Laser magnetic resonance spectra of nitrogen dioxide were observed using the 311 and 337 micron hydrogen cyanide laser lines as the source, and hyperfine components of four rotational transitions were assigned. Although the qualitative agreement between the observed and predicted spectra was excellent, the value of the isotropic electron spin g factor (2.013) required to fit the data quantitatively was significantly larger than that found in the solid state. The anisotropic electron spin g factor (-0.010) which was determined agreed well with that found in the solid state. Four additional rotor frequencies obtained increase the number of accurately known rotor frequencies for 14N1602 to eleven; this is still an insufficient number to determine the centrifugal distortion constants. (Author summary modified)

32693 **APTIC NO. 54708**

Dacre, P. D. and M. Elder

SULPHUR DIOXIDE. NOTES ON THE ELECTRONIC CHANGES WHICH OCCUR ON COORDINATION. *Theor. Chim. Acta, 25(3):254-258, 1972. 21 refs.*

The sulfur dioxide molecule and the two negative ions, SO2(-) and SO2(2-) were studied by ab initio SCF-MO methods using a small but flexible Gaussian orbital basis set. The calculations were performed for two different geometries with the aim of providing some information about the electronic changes which occur in the molecule when it coordinates to transition metal complexes. The total energies for the SO2 ground state in the two different geometries were separated by 0.009 a.u. with the experimental geometry giving rise to the higher figure; this indicates an energy plateau as far as small, symmetric deformations of the isolated molecule are concerned. With regard to SO2 coordination to transition metal complexes, the 3b1 orbital has the correct symmetry for sigma-bond formation between sulfur and another atom in such complexes as S2O24 and RhCl(CO)(SO2)(P(C6H5)2), where the SO2 group is oriented such that the normal to the SO2 plane is at aobut 30 deg from the line of the S-S or S-Rh bond. The geometry changes which will enhance the stability of a system where the SO2 3b1 orbital is occupied will be S-O bond lengthening and a decrease in the angle between the two S-O bonds. The orbital 8a1 is the source of the electron pair needed for sigma-bond formation in complexes such as (RuCl(NH3)4S02)Cl, where the SO2 group acts as a Lewis base. The electronic configuration of SO2 in the ruthenium amine complex will resemble that in an excited state of SO2 that can be described as (1a2)2(8a1)1(3b1)1.

32694 **APTIC NO. 54666**

Decamps, F., G. Dumont, and W. Goossens

VERTICAL PNEUMATIC CONVEYER WITH A FLUIDIZED BED AS MIXING ZONE. *Powder Technol. (Amsterdam), 5(5):299-306, 1971/1972. 10 refs.*

A mathematical model has been developed to describe the transport of solids in a gas lift system, with a fluidized bed as mixing zone. Its validity was checked in gas lifts with different transport heights, using alumina and uranium dioxide spheres as solids. The two solid phase parameters used in the model are the slip velocity delta(u) between gas and solids and an empirical coefficient alpha, which accounts for hindered settling of the particles in the transport tube. These parameters are determined by the experimental procedure. It could be deduced that the particles are transported in clusters due to the attractive forces between them and also due to the fact that dune transport cannot be avoided in this low energy system Compared to classical transport devices, high transport efficiencies are thus obtained. An interesting application of the gas lift system as an internal mixing device of dissimilar solids with high demixing tendencies in a fluidized bed system is proposed. (Author summary)

32695 APTIC NO. 54283

Deitz, V. R. and J. L. Bitner

THE REACTION OF OZONE WITH ADSORBENT CHARCOAL. *Carbon, 10(2): 145-154, April 1972. 15 refs.*

The progressive reaction of ozone and oxygen mixtures with charcoal at 26 C was studied to specified weight-gains and to different subsequent weight-losses when outgassed at various temperatures. Although each ozone-treated adsorbent gave evidence of continuous decomposition when introduced into a vacuum adsorption apparatus, stability was obtained when the sample was cooled to 77.4 K. The degassing is associated with an inherent unstability of the ozone-product formed and not to described gases. The products were characterized by very large decreases in the nitrogen adsorption at 77.4 K. Two explanations are examined to account for the adsorption behavior. First, the etching reactions that prevailed during the formation of the original carbon adsorbent can continue and lead to pore structures of greater diameters (and accordingly lesser specific surface area) than the original charcoal. Second, a blockage of the micropore openings to nitrogen molecules can take place due to the chemisorption of oxygen at the critical openings of the porous carbon structure. A sequence of three reactions is suggested to explain both the weight changes upon ozone treatment and the unique behavior of the nitrogen adsorption isotherms determined at 77.4 K. (Author abstract)

32696 APTIC NO. 54803

Derjaguin, B. V. and Yu. I. Yalamov

INTRODUCTION. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, p. 5-15. (Complete book has been abstracted as APTIC 52160.)*

When considering the motion of isolated aerosol particles in a free volume of a gas homogeneous in composition and temperature, the mechanical equations of motion can be supplemented by laws of dependence of the frictional resistance on the velocity and radius of the particles and, in the cases of volatile particles, with the laws of their growth and evaporation inasmuch as they affect the change in particle mass with time. For fairly large and non-volatile aerosol particles it is sufficient to use Stokes law derivable from the phenomenological hydrodynamics of a viscous liquid, and then the problem becomes a mechanical one. Complications requiring a molecular-physical approach may be of different origins. If there is a diffusion flow of another gas or vapor in the gas in question, a diffusiophoretic force appears causing diffusiophoresis of the aerosol particle. A phenomenon close in nature to thermophoresis, known as radiometric effect, occurs if the particle is in the path of thermal radiation. An exhaustive theory of photophoresis can be built only after the theory of thermophoresis is complete. Previous studies and theories of thermophoresis and diffusiophoresis are reviewed. As in the case of thermophoresis, the correct theory of diffusiophoresis of large particles can be brought to completion by methods of the thermodynamics of non-equilibrium processes. A very effective method for calculating the velocity of diffusiophoresis of small particles is based on the calculation of the momentum imparted to the particle by the gas mixture unperturbed by the presence of the aerosol particle. By this method a generalized theory of diffusiophoresis of small aerosol particles was developed allowing for the nature of the interaction between the gas molecules and the particle surface (part of the molecules being specularly and the rest diffusely reflected). Allowance for the diffusiveness of the interaction approaches theoretical results obtained earlier.

32697 APTIC NO. 54804

Derjaguin, B. V. and Yu. I. Yalamov

THEORY OF DIFFUSIOPHORESIS OF SMALL AEROSOL PARTICLES. *In: Topics in Current Aerosol Research. G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 1, p. 16-32. (Complete book has been abstracted as APTIC 52160.)*

The velocity distribution functions of the molecules of a binary gas mixture, the velocity of diffusiophoresis of a small aerosol particle relative to the center of inertia of a gas mixture, and the velocity of diffusiophoresis relative to a laboratory coordinate system are calculated.

32698 APTIC NO. 54805

Derjaguin, B. V. and Yu. I. Yalamov

THEORY OF DIFFUSIONAL OSMOSIS IN GASES. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 2, p. 33-40. (Complete book has been abstracted as APTIC 52160.)*

Before calculating the velocity of diffusiophoresis by the method of thermodynamics of steady-state processes using Onsager's principle of the symmetry of kinetic coefficients, this method was used to calculate diffusional osmosis in a capillary. The result coincides with the velocity of transfer of the center of inertia of the binary gas mixture relative to the system of coordinates fixed to the vessel walls obtained by direct calculation on the basis of the gas kinetic theory, making use of the gas molecule distribution function in the second approximation of the Chapman-Enskog theory. Such a coincidence demonstrates the fruitfulness of the thermodynamic approach which gives correct results by a mathematically simpler method. With the aid of the transport equation, the pressure drop arising across the closed ends of a capillary (or slit) was derived. The quasi-thermodynamic approach to the theoretical investigation of the diffusion pressure drop was very fruitful, accurate, and comparatively simple.

32699 APTIC NO. 54806

Derjaguin, B. V. and Yu. I. Yalamov

THEORY OF THERMAL AND DIFFUSION SLIP OF GAS ON A SOLID SURFACE. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 3, p. 41-96. (Complete book has been abstracted as APTIC 52160.)*

In the absence of thermodynamic equilibrium, the state of a gas near a gas-solid interface differs greatly from its bulk state. It is especially interesting to study the behavior of a gas near a solid surface in the presence of tangential gradients of temperature, pressure, and concentration due to the fact that knowledge of the strict velocity distribution function of gas molecules, when the gas in nonuniform near the wall, enables calculation of the velocity of slip of the gas on the wall. It becomes possible to solve a number of problems of thermophoresis and diffusiophoresis of aerosols, of the diffusional osmosis of gas mixtures, and of thermal transpiration. The question is therefore of basic significance in molecular physics and gas dynamics at gas-condensed interfaces. Previous methods of deriving thermal and diffusion slip are cited, and new direct methods of computing the coefficient of slip are explained in detail. These new methods involve direct calculation of the velocity of a gas moving along a flat solid surface in the presence of a temperature gradient tangential to the wall on the basis of the gas-molecule velocity distribution function derived by solving the Boltzmann kinetic equation. These methods include: the method of Bhatnagar, Gross, and Krook for determining the velocity of thermal slip near a solid surface; the velocity distribution function of gas molecules near a solid wall in a nonuniformly heated gas with allowance for the exact collision integral; velocity of thermal slip; calculation of velocity of thermal slip based on the solution of the model

Boltzmann equation (Bhatnagar method) with allowance for the dependence of the velocity of slip on the distance to the flat surface; and solution of the integral equation for the mean velocity of thermal slip of a gas on a solid flat surface. The integral equation is derived for the velocity of a binary gas mixture in a Knudsen layer. Solution of an integral equation by the Wiener-Levenson method, binary gas diffusion slip velocity on a flat solid surface, and isothermal couette flow of a gas on a flat solid surface are used to obtain a new, more correct value for the coefficient of diffusion slip.

32700 **APTIC NO. 54807**

Derjaguin, B. V. and Yu. I. Yalamov

THEORY OF DIFFUSIOPHORESIS OF LARGE AEROSOL PARTICLES. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 4, p. 97-136. (Complete book has been abstracted as APTIC 52160.)*

The theory of movement of small aerosol particles in a diffusing binary gas mixture assumes that the gas molecule distribution in the bulk is undisturbed by the presence of an aerosol particle. In the case of large aerosol particles, the problem is greatly complicated by the distortion of the bulk distribution functions in the neighborhood of the aerosol particle. The theory of diffusiophoresis of large non-volatile aerosol particles and the theory of diffusiophoresis of large spherical drops of a solution in a binary gas mixture are discussed. A direct method of calculating the diffusiophoretic force acting on a large non-volatile aerosol particle and a direct method of calculating the diffusiophoretic force acting on a large volatile one-component aerosol particle are discussed. The formulae for the velocity of diffusiophoresis for small and large aerosol particles were compared with experimental data obtained by the direct measurements of the velocity of diffusiophoresis. The theoretical results obtained for the velocity of diffusiophoresis is in good agreement with experimental data.

32701 **APTIC NO. 54808**

Derjaguin, B. V. and Yu. I. Yalamov

THEORY OF THERMOPHORESIS OF AEROSOL PARTICLES. *In: Topics in Current Aerosol Research (Part 2.) G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 5, p. 137-190. (Complete book has been abstracted as APTIC 52160.)*

Theories of thermophoresis of aerosol particles having Knudsen numbers much larger than unity are discussed. The velocity of thermophoresis as a limit case of thermodiffusion and the resultant force acting on a particle suspended in a nonuniformly heated gas are calculated. Onsager s phenomenological equations and reciprocity relations for thermomechanical effects on gases are described. A thermodynamic derivation of a formula for the velocity of thermophoresis of large and moderately large non-volatile aerosol particles is given. The direct calculation of the velocity of thermophoresis of moderately large aerosol particles is shown. The calculation of the velocity of thermophoresis is given, along with the unit, objects, and procedure of experiments used in studying thermophoresis. The cell for measuring the velocity of thermophoresis is described. Experiments in which steps are taken either to make allowance for thermal convective gas flows or to avoid their appearance agree satisfactorily with the theory derived by the thermodynamic method.

32702 **APTIC NO. 54809**

Derjaguin, B. V. and Yu. I. Yalamov

REVIEW OF RESULTS. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 6, p. 191-197. (Complete book has been abstracted as APTIC 52160.)*

A review of the results of the theory of thermophoresis and diffusiophoresis of aerosol particles and their experimental testing is given. A theory of diffusiophoresis of small aerosol particles was developed for any kind of interaction of gas molecules with a particle surface. A theory of diffusiophoresis of large non-volatile and volatile aerosol particles and solution drops was built by the method of the thermodynamics of irreversible processes. A theory of the diffusiophoresis of large non-volatile and volatile aerosol particles is given, based on direct calculation of the force acting on these particles. A theory of thermal slip of a one-component gas on a flat solid surface is given, based on solution of the Boltzmann kinetic equation with allowance for the collision integral. An integral equation was derived for the velocity of slip of a binary gas mixture on a flat solid surface in the presence of a tangential gradient of temperature. A theory of thermophoresis of moderately large and large aerosol particles in one-component gases was built. The theory of thermophoresis for small particles accounts satisfactorily for the experimental results of investigations in which the convective flows of the gas were either taken into account or eliminated. A formula was obtained for the thermomolecular pressure drop between the ends of the moderately wide capillary. The results obtained in this work for the velocity of thermophoresis and diffusiophoresis of aerosol particles is useful for the designing of instruments and units for removing aerosol impurities from gas flows.

32703 **APTIC NO. 54810**

Derjaguin, B. V. and Yu. I. Yalamov

REFERENCES. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, p. 198-200. 141 refs. (Complete book has been abstracted as APTIC 52160.)*

References and supplementary references are given for the theory of thermophoresis and diffusiophoresis of aerosol particles and their experimental testing.

32704 **APTIC NO. 54811**

Drake, R. L.

INTRODUCTION. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 1, p. 208-210. (Complete book has been abstracted as APTIC 52160.)*

The science of aerodisperse systems, or aerosols, is introduced. The physical properties of solid and liquid particles are size dependent and can be divided into three categories based on certain transitions which are due to the mean-free-path of gas molecules and the average wavelength of visible light. In order to study how various physical phenomena affect clouds of particles, macroscopic characteristics such as frequency, weight, mass, volume, cumulative distribution functions, various mean sizes and weights are useful parameters. Size spectra of aerosols are both polydispersed and time dependent, so the evolution of the size spectrum is of great importance. The emphasis in this review is the time evolution of particle size spectrum, rather than the physics of individual particle movement in aerosols. The coagulation process as it affects particle size distribution, especially through condensation, evaporation, breakup, precipitation, and coagulation is considered in mathematical models. The theory of coagulation deals with the process of adhesion or coalescence of aerosol particles when they come into contact with one another. Thermal coagulation, rapid coagulation, slow coagulation, directed coagulation, kinematic coagulation, and acoustic coagulation are defined.

32705 **APTIC NO. 54812**

Drake, R. L.

HISTORY AND DERIVATIONS. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 2, p. 212-237. (Complete book has been abstracted as APTIC 52160.)*

The history and derivation of the kinetic theory of the coagulation process is given. Smoluchowski s theory of rapid coagulation in which he applied the theory of Brownian motion to the statistical problem of the collision of hard non-interacting spheres thermally agitated in a continuum, is discussed. This analysis completely determines the rate of rapid coagulation of aerosols in a static dispersing medium where only binary collisions occur. Mueller extended this theory to polydisperse aerosols. Friedlander formalized a rate equation which extended Smoluchowski s theory to cover the evolution of the particle size spectrum of a condensing vapor. Marcus developed a discrete form of the coagulation equation describing the growth of cloud droplets by coalescence in rain-producing clouds. Warshaw s derivation of the coalescence equation deals with a cloud of fixed volume whose droplets are uniformly distributed due to turbulent mixing and the droplets fall at their still air terminal velocities. Scott showed that the correlation effects in a cloud droplet distribution are small and decrease with time. Berry presents a model for the time evolution of a cloud droplet spectrum. Levin and Sedunov developed a theoretical model for the time evolution of a droplet spectrum in clouds which deals with the kinetic equation. Melzak discusses particle breakup, and Zebel derives an equation for the time rate of change of the size density function of an electrically charged aerosol.

32706 **APTIC NO. 54813**

Drake, R. L.

EXISTENCE, UNIQUENESS, BOUNDEDNESS, AND POSITIVENESS. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 3, p. 238-261. (Complete book has been abstracted as APTIC 52160.)*

A large number of randomly distributed aerosol particles moving under the influence of random fields such as Brownian motion and turbulence are considered. the particle cloud is assumed to be sufficiently well organized and dense so it can be described by a particle size density function. The mathematical models previously derived resulted in integrodifferential equations or infinite sets of ordinary equations for the density function of the particle cloud. Theoretical results obtained by Melzak, Morgenstern, and McLeod for the systems previously derived are discussed to determine if they meet six conditions necessary for good formulation of physical problems. The conditions of uniqueness and existence for bounded kernels and for certain unbounded kernels are discussed in detail. The work of McKean and Knight are discussed to review a somewhat different statistical approach to the coalescence problem.

32707 **APTIC NO. 54814**

Drake, R. L.

KERNELS AND INITIAL SPECTRA. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 4, p. 262-284. (Complete book has been abstracted as APTIC 52160.)*

Equations are given that mathematically describe an aerosol cloud under the influence of continuous and spontaneous coagulation. The particles in the cloud may coalesce whenever they come into contact. Since this process is continuous, the aerosol becomes coarser with time. Thus the particles finally precipitate out of the cloud, or they break up into smaller particles. Qualitative effects of coagulation are discussed, and Brownian diffusion, polydispersity, internal force fields, external force fields, kinematic coagulation, directed coagulation, and thermal coagulation are included. Kernals which are functions of the physical properties of the medium, the governing coagulation processes, and the particle sizes are given. The collection process which affects the formation of rain and the capture of airborne aerosols by cloud droplets and raindrops is discussed. Several empirical formulas of spectra for various aerosols under a variety of atmospheric conditions are given.

32708 **APTIC NO. 54815**

Drake, R. L.

POWER MOMENTS. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 5, p. 285-304. (Complete book has been abstracted as APTIC 52160.)*

Power moments have been employed in the kinetic theory of gases for several years. The moment problem of Stieltjesis discussed. If knowledge is possessed about the moment function of a distribution function, the distribution itself can be found or approximated by the inverse Mellin transform. Golovin calculated the evolution of the spectrum of coagulating cloud droplets in a rising air stream by a method similar to that of Grad. Through the use of transform methods, the moments can be obtained. A first order approximation for the spectrum of rising droplets can also be obtained. The more general system of Enukashvili is discussed. He solved the kinetic coagulation equation for spatially uniform clouds for cases of Brownian and gravitational coagulation. Golovin considered the kinetics of cloud droplets in a stationary axisymmetrical cumulus cloud, assuming that in the lower and middle parts of a cloud in intensive updrafts where the air velocity is increasing with altitude, the cloud droplet spectrum is bimodal. Other examples of the application of power moments of the distribution function to check the techniques of solving various kinetic equations or hypotheses are mentioned. The relationship between power moments (not necessarily integral moments) and the forms of the collection kernel in the pure coagulation process is discussed in detail.

32709 **APTIC NO. 54816**

Drake, R. L.

EXACT SOLUTIONS. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 6, p. 305-321. (Complete book has been abstracted as APTIC 52160.)*

The only exact solutions for an evolving aerosol cloud are for the pure coagulation process. Exact solutions for two dimensionless forms of pure coagulation are given. Systems which are slight modifications of the original equations are discussed.

32710 **APTIC NO. 54817**

Drake, R. L.

APPROXIMATE SOLUTIONS. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, Chapt. 7, p. 322-367. (Complete book has been abstracted as APTIC 52160.)*

Numerical methods employed in solving systems involving the process of coagulation and coalescence are discussed. Theoretical results can be proved through the vehicle of a power series expansion in the time variable. A truncated power series can be used to approximate the solutions of the pure coagulation equation. The successive approximation theory is an improvement over the power series, and although they both are poor at defining the tail of the spectrum, they can be used successfully in the initial stages of the evolving spectrum. They can be used in combination with asymptotic solutions in defining the entire history of the evolving spectrum. Similarity solutions result in a numerical exercise that leads to an approximation of the evolving spectrum. The asymptotic method, called the saddlepoint method, is applied directly to the inverse Laplace transform of the particle spectrum. A combination of these four methods is useful. The technique of moments expresses the evolving spectrum as a series of orthogonal functions with coefficients dependent upon the power movements of the spectrum. Perturbation methods which solve nonlinear systems include variables of parameter perturbation, coordinate perturbation, asymptotic perturbation, rational perturbation, and irrational perturbation. Numerical computation by large digital computers uses schemes which replace integrals by finite sums and replace the infinite sum by a finite, truncated series. The Monte Carlo method is any procedure which involves the use of statistical sampling techniques to approximate the solution of a mathematical or physical problem. This procedure is used to directly simulate the accretion process of aerosol particles and cloud droplets. A model for the stochastic, coalescence growth of water drops considers a discrete size spectrum and yields a simple set of equations. Several other variations are presented.

32711 **APTIC NO. 54818**

Drake, R. L.

LIST OF SYMBOLS. APPENDIX. REFERENCES. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, p. 204-207, 368-376. 250 refs. (Complete book has been abstracted as APTIC 52160.)*

A list of symbols, an appendix, and references are given for the article A General Mathematical Survey of the Coagulation Equation. The appendix explains the notation in equations.

32712 **APTIC NO. 54446**

Fouche, D. G., A. Herzenberg, and R. K. Chang

INELASTIC PHOTON SCATTERING BY A POLYATOMIC MOLECULE: NO2. *J. Appl. Phys., 43(9):3846-3851, Sept. 1972. 19 refs.*

The frequency distribution of photon scattering inelastically (consisting of discrete spikes superimposed on a broad continuum) resulting from illumination of nitrogen dioxide by monochromatic visible light was compared with the Raman scattering from nitrogen with respect to the following variables: argon ion laser wavelengths, NO2 pressure, and air pressure. The intensity scattered by a molecule of NO2 was 116 times the Raman intensity from a molecule of N2, NO2 being in air at standard temperature and pressure. The broad continuum intensity from NO2 was measured at 720/cm, from a 4880 A laser wavelength, and with a spectrometer slit width of 10 A; and the quenching constant for the NO2 continuum by air was 67/torr. The observed dependence of the scattered intensity on wavelength and pressure can be explained qualitatively in terms of an expected dense distribution of energy levels in NO2. (Author abstract modified)

32713 **APTIC NO. 54995**

Golde, M. F. and B. A. Thrush

VACUUM ULTRAVIOLET EMISSION BY ACTIVE NITROGEN. II. THE EXCITATION OF SINGLET AND TRIPLET STATES OF CARBON MONOXIDE BY ACTIVE NITROGEN. *Proc. Roy. Soc. London, Ser. A., 330(1580):97- 108, 1972. 13 refs.*

The addition of small amounts of carbon monoxide to active nitrogen induced strong emission of the CO fourth positive bands, (A1II-X1Sigma plus), which extended up to v prime equal to 8. The kinetic behavior of the emission was closely similar to that of the Lyman-Birge-Hopfield emission of nitrogen, comprising terms proportional to (N)2/((M)plus gamma) and (N)3/(M), the latter being enhanced in argon carriers. The CO(A1II) was excited by efficient energy transfer from N2(a1IIg) and was removed predominantly by radiation. Excited triplet states of N2 excited triplet states of CO but did not contribute significantly to singlet CO emission. Spin conservation appeared to be important in energy transfer from N2 to CO and between excited electronic states of CO as found previously for excited electronic states of N2 in active nitrogen where conversion from the triplet system to the singlet system was detectable only as a spin allowed process involving collision with nitrogen atoms. (Author abstract modified)

32714 **APTIC NO. 54821**

Gruenwald, Alois and Walter Blazejovsky

THE CALCULATION OF FRONT-END OCTANE NUMBERS OF GASOLINE BLENDS. *(Die Berechnung der Frontend-Oktanzahl von Benzingemischen aus den Kenndaten der Mischungskomponenten). Text in German. Erdoel Kohle (Hamburg), 25(4):201-204, April 1972. 4 refs.*

A simple, computer-compatible method, based on some easily determinable data of the blending components used, is given for the calculation of the front-end octane number of commercial gasolines. For the calculation of the front-end octane number of gasoline blends from some physicochemical properties of the components, the quantity of the lead alkyl entrained by the light-weight hydrocarbons was assumed to be a function of the quantity of the hydrocarbons passing through before the cut temperature is reached. The quantity of the lead alkyl distilled together with the light-weight hydrocarbons was not influenced by the chemical structure of the distilled hydrocarbons. However, the relative quantity of the lead alkyls retained by the distillate was practically independent of their absolute initial concentration. The modified Esso method was used for the determination of the front-end octane number for gasoline blends with tetramethyl lead. Nearly quantitative retention of tetraethyl lead in the distillation residue was observed.

32715 **APTIC NO. 54684**

Hales, J. M., L. C. Schwendiman, and T. W. Horst

AEROSOL TRANSPORT IN A NATURALLY-CONVECTED BOUNDARY LAYER. *Intern. J. Heat Mass Transfer, 15(10):1837-1850, Oct. 1972. 14 refs.*

A generalized method is described for the estimation of aerosol deposition to a vertical, isothermal surface through both turbulent and laminar naturally-convected boundary layers. The method is applicable to both noncondensing and condensing systems; liquid-film effects are a potential source of error in situations involving the latter, but such errors are expected to be of secondary importance in most cases of practical interest. The equations presented compare with computed solutions to laminar boundary-layer equations reasonably well. No such comparison has been made for the turbulent regime, owing to the absence of a more refined analysis, either theoretical or experimental in nature. Despite these obvious difficulties, the equations are recommended for use whenever related engineering calculations are necessary based partially upon the fact that there exists at present no other simple and reasonable means for approaching the problem; it is based also, however, upon the fact that the comparisons that are available tend to testify to the general validity of the procedure. Average fluxes must be computed from the local values by simple integration over the vertical surface since all derivations herein have pertained to local fluxes and homogeneous aerosols. Similarly, if the aerosol of interest is heterogeneous in nature, then results must be computed from the analysis of this paper for a number of aerosol sizes and distributed accordingly. (Author conclusions modified)

32716 **APTIC NO. 54449**

Hanazaki, Ichiro

VAPOR-PHASE ELECTRON DONOR-ACCEPTOR COMPLEXES OF TETRACYANOETHYLENE AND OF SULFUR DIOXIDE. *J. Phys. Chem., 76(14):1982-1989, 1972. 26 refs.*

The electron donor-acceptor complexes of benzene, toluene, o-xylene, and naphthalene with tetracyanoethylene (TCNE) and of trans-2-butene with sulfur dioxide were investigated spectrophotometrically in the vapor phase. The results obtained at various temperatures were analyzed simultaneously by a modified least-squares treatment of the Scott equation. The results show that the differences between the thermodynamic and spectral properties obtained in the vapor phase and those obtained in solution are in accordance with general tendencies observed so far. However, in contrast to previous results, the intensity of the charge-transfer (CT) absorption band of the TCNE complexes with methylbenzenes increases upon methyl substitution, in parallel with the heat of formation. This is in accordance with the theoretical prediction derived on the assumption that the donor-acceptor bond is mainly of CT nature. Attempts to study vapor-phase CT spectra in a number of other systems were made but were unsuccessful. (Author abstract)

32717 **APTIC NO. 54802**

Hidy, G. M. and J. R. Brock

PREFACE. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, p. vii-viii. (Complete book has been abstracted as APTIC 52160.)*

To focus attention on the variety of important aerosol research presently being published and to increase international communications between workers in this field, this book has been published as the third in a series entitled International Reviews in Aerosol Physics and Chemistry. It consists of two articles, The Theory of Thermophoresis and Diffusiophoresis of Aerosol Particles and Their Experimental Testing by B. V. Derjaguin and Yu. I. Yalamov, and A. General Mathematical Survey of the Coagulation Equation by R. L. Drake.

32718 **APTIC NO. 54819**

Hidy, G. M. and J. R. Brock (eds.)

SUBJECT INDEX. AUTHOR INDEX. *In: Topics in Current Aerosol Research (Part 2). G. M. Hidy and J. R. Brock (eds.), New York, Pergamon Press, 1972, p. 377-384. (Complete book has been abstracted as APTIC 52160.)*

The author and subject index is given for this book which consists of two articles, The Theory of Thermophoresis and Diffusiophoresis of Aerosol Particles and Their Experimental Testing by B. V. Derjaguin and Yu. I. Yalamov, and A General Mathematical Survey of the Coagulation Equation by R. L. Drake.

32719 **APTIC NO. 55167**

Horowitz, Abraham and Jack G. Calvert

A STUDY OF THE INTERSYSTEM CROSSING REACTION INDUCED IN GASEOUS SULFUR DIOXIDE MOLECULES BY COLLISIONS WITH NITROGEN AND CYCLOHEXANE AT 27 C. *Intern. J. Chem. Kinet., 4(2):191-205, March 1972. 11 refs.*

The quantum yields of the sulfur dioxide triplet (3SO2)- sensitized phosphorescence of biacetyl (Phi sens) were determined in experiments with nitrogen-sulfur dioxide-biacetyl (N2-SO2-Ac2) and cyclohexyl-sulfur dioxide-biacetyl (C6H12-SO2- Ac2) mixtures excited at 2875 A at 27 C; and the fraction of the biacetyl triplets which reacts homogeneously by radiative or nonradiative decay reactions was determined in a series of runs at constant (SO2)/(M), where M is the collision partner, and (SO2)/(Ac2) ratios but at varied total pressure. A kinetic treatment of the Phi sens resulted, and singlet sulfur dioxide (1SO2) quenching rate constant data gave the following new kinetic estimates for the reactions 1SO2 plus M producing (SO2-M) (1b) and 1SO2 plus M producing 3SO2 plus M (2b): for 1SO2-N2 collisions, k2b/(k1b plus k2b) equals 0.033 + or - 0.008; for 1SO2-c-C6H12 collisions, k2b(k1b plus k2b) equals 0.073 + or - 0.024; previous studies have shown this ratio to be 0.095 + or 0.005 for 1SO2-SO2 collisions. The intersystem crossing ratio in 1SO2 induced by collision was relatively insensitive to the nature of the collision partner M. However, the individual rate constants for the collision-induced spin inversion of 1SO2 (k2b) and the total 1SO2-quenching constants (k1b plus k2b) were quite sensitive to the nature of M: k2b/k2a varied from 0.10 + or 0.03 for M equal to N2 to 1.11 + or 0.37 for M equal to c-C6H12, and (k1b plus k2b)/(k1a plus k2a) varied from 0.29 for M equal to N2 to 1.44 for M equal to c-C6H12, where k1a and k1b are the rate constants for the reactions 1SO2 plus SO2 produces (2SO2) (1a) and 1SO2 plus SO2 produces 3SO2 plus SO2 (2a), respectively. (Author abstract modified)

32720 **APTIC NO. 54347**

Jensen, Marcus M.

ENVIRONMENT CONTAMINANT CONTROL CONSOLE. *(Assignee not given.) U. S. Pat. 3,665,917. 5p., May 30, 1972. 9 refs. (Appl. Oct. 1, 1969, 9 claims).*

A compact, conveniently mobile console inducing coughing by aerosol inhalation and for collecting sputum while preventing the scattering of infectious droplets is described. A pre-filter is mounted in the console cavity to catch primary portions of airborne particles, while an absolute filter positioned below the pre-filter receives and contains the balance of any microorganisms or foreign substances desirable for separation from the environment of the console. An electric fan which is positioned within the console downstream from the absolute filter evacuates air from the hood of the console and its immediate environs, and the contaminated air is drawn through the filters for deposition of the contaminants thereon. The filtered air is exhausted from some convenient part of the console. A tube or hose leads to the hood from an aerosol dispenser or nebulizer used in conjunction with the console for delivery of aerosol to the mouth of the patient and induction of the desired coughing reaction. (Author summary modified)

32721 **APTIC NO. 54789**

Klomp, E. D. and G. Sovran

THE FLUID MECHANICS OF MULTIPLE-VENTURI SYSTEMS AND THEIR APPLICATION TO FLOW-RATE METERING. *J. Basic Eng., 94(1):39-45, March 1972. 12 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Washington, D. C., Nov. 28, 1971-Dec. 2, 1971, Paper 71-WA/FE-27.)*

The application of the concept of a multiple-venturi system to fluid flow-rate measurement is considered in detail. The primary advantages of a multi-venturi meter are its broad flow range and the large metering signal that can be obtained with low overall loss and in a relatively short overall length. In effect, a single multi-venturi meter can perform the function of several different sizes of orifices, nozzles, or venturi meters. A three-element meter tested had a figure-of-meter of over twice that of a single-venturi device. Optimization studies performed with an analytical model of multi-venturi systems indicate that a significantly higher figure-of-merit can be achieved with a three-element meter than with a two-element one. However, a further increase in the number of venturis only promises a rather small additional improvement. (Author summary modified)

32722 **APTIC NO. 54280**

Lamourelle, Alain P. and Orville C. Sandall

GAS ABSORPTION INTO A TURBULENT LIQUID. *Chem. Eng. Sci., 27(5):1035-1043, May 1972. 34 refs.*

Mass transfer coefficients were measured for the liquid phase for gas absorption into a turbulent liquid flowing down a long wetted-wall column. Helium, hydrogen, oxygen, and carbon dioxide were absorbed into distilled water over a Reynolds number range of 1300-8300. The results indicate that the liquid phase mass transfer coefficient is proportional to the molecular diffusion coefficient raised to the 0.54 power. The results are interpreted in terms of an eddy diffusivity model and indicate that the eddy diffusivity increases as the square of the distance from the interface. (Author abstract)

32723 **APTIC NO. 54700**

Lelli, U., F. Magelli, and C. Sama

BACKMIXING IN MULTISTAGE MIXER COLUMNS. *Chem. Eng. Sci., 27(5):1109-1117, May 1972. 13 refs.*

Dynamic analysis was performed on the net flow rate and the fluid viscosity influence on backmixing in multistage, baffled and unbaffled, mixer columns. Experimental outlet concentration curves were interpreted by means of analytical treatment of the model of a cascade of ideal tanks with backmixing given by Roemer and Durbin, and the values of the backmixing flow rates were estimated from the position of the maximum point of the experimental curve versus the adimensional position of the maximum point. The experiments showed ranges of Reynolds rotational numbers in which the net flow rate and the fluid viscosity have considerable influence on the degree of backmixing. The maximum blackflow rate was found to invariably occur for non-flow runs for a given column size, impeller speed, and fluid viscosity. Comparison of interstage and intrastage backflow rate models of the cascade demonstrated that the intrastage backflow rate is less dependent on net flow rate than the classical parameter of interstage backflow rate; hence, intrastage backflow rate is introduced as a new fluid-dynamic parameter for more accurately representing the behavior of the backmixing phenomenon.

32724 **APTIC NO. 54800**

Lowder, J. E.

BAND INTENSITY AND LINE HALF-WIDTH MEASUREMENT IN N_2O NEAR 4.5 MICRON. *J. Quant. Spectro. Radiative Transfer, 12(5): 873-880, May 1972. 22 refs.*

Integrated band intensities of the nitrous oxide v3-fundamental and the overlapping (v2 plus v3 minus v2)-band were measured and found to be 1285 and 176/sq cm atm, respectively, at 300 K. The integrated intensities were estimated separately by using the just-overlapping line model, and the sum of the intensities of these two bands compared favorably with three prevouos measurements but was 12-15% lower than two other reported measurements. The ratio of the (v2 plus v3 minus v2)-band intensity to the v3-fundamental intensity of 0.137 may be compared with the ratio of 0.119 for the population of the first excited v2-state and the ground state; the comparison shows that the v3-fundamental transition probability is not greatly affected by the v2-fundamental in the first excited state. Measurement of the nitrogen-broadened half-widths of rotational lines in the v3-fundamental was in agreement with calculations based on the Anderson-Tsao-Curnutte theory and was within the limits of experimental error up to a rotational quantum number of about 40. The agreement lends confidence to the N_2 and N_2O quadrupole moments used in the calculations.

32725 **APTIC NO. 54444**

Mills, A. F. and A. Wortman

TWO-DIMENSIONAL STAGNATION POINT FLOWS OF BINARY MIXTURES. *Intern. J. Heat Mass Transfer, 15(5):969-987, May 1972. 18 refs.*

Comprehensive numerical solutions for axisymmetric and planar stagnation point flows of air were obtained at wall cooling ratios of 0.1, 0.5, and 0.9 with the following foreign gas injected species: atomic hydrogen, molecular hydrogen, helium, carbon, methane, oxygen atom, water, neon, air, argon, carbon dioxide, xenon, carbon tetrachloride, and iodine. Consideration of a wide variety of injectants allowed for explanation of the effect of injectant thermodynamic and transport properties on the reduction, due to mass transfer, of wall shear stress, mass transfer conductance, and heat transfer rate. An increased pressure gradient at planar stagnation points yielded mass and heat transfer data which are little different from those for the axisymmetric situation. Engineering correlations for mass and heat transfer were developed and are of the exponential form suggested by a Couette flow model, with suitable weighting of the blowing parameter. The correlations apply to monatomic, diatomic, and polyatomic molecules for a large range of wall cooling and both axisymmetric and planar stagnation points. (Author conclusions modified)

32726 **APTIC NO. 54735**

Mizushima, Masataka, K. M. Evenson, and J. S. Wells

LASER MAGNETIC RESONANCE OF THE NO MOLECULE USING 78-, 79-, AND 119-MICRON H_2O LASER LINES. *Phys. Rev. A, 5(5):2276-2287, May 1972. 32 refs.*

The magnetic resonance of the nitric oxide molecule was observed using the 78-, 79-, and 119-micron lines of the water laser as the radiation source. The resonances in the three cases were due to several transitions, most of them were magnetic dipole transitions, but a few electric dipole transitions were also observed. The calculated g factors and the calculated A-doublet separations were consistent with the experimental results. The hyperfine structure and the second-order effects were also in agreement with theoretical values. The average separation between the 2Pi sub 3/2 and 2Pi sub 1/2 states for a given J, called XJ, was 126.4469 + or 0.0005/cm for J equals 11.5 and 12.5, respectively. The conventional spin-orbit coupling constant was 123.1580 + or 0.0010/cm when J equals 12.5 or 11.5. The coupling constant mu sub s for the S.N term was -0.006 + or - 0.002/cm. (Author abstract modified)

32727 **APTIC NO. 54790**

Ruckenstein, E.

TURBULENT HEAT TRANSFER TO NON-NEWTONIAN FLUIDS. *Chem. Eng. Sci., 27(5):947-957, May 1972. 28 refs.*

Turbulent heat transfer to non-Newtonian fluids has been treated by means of a physical model proposed previously in which it is assumed that the turbulent motion near the wall may be decomposed in a succession of laminar boundary layers; the cases of power law and viscoelastic fluid were treated for illustration purposes. Mathematical treatment of the power case illustrates a technique which can be used for obtaining, on the basis of the present physical model, equations for the heat transfer coefficient for any non-Newtonian. The case of turbulent heat-transfer to viscoelastic fluids illustrates that it is reasonable to expect drag reduction because the shear stress at the wall is smaller in the viscoelastic case than in the Newtonian one. The drag reduction is a consequence of the finite propagation velocity of the shear stress in the viscoelastic fluid and the delay introduced by viscoelasticity in the renewal process. Comparison of an equation developed for the viscoelastic case with experimental results generated a proportionality constant value of 0.3.

32728 **APTIC NO. 54895**

Seki, Toshihiko and Koji Abe

THE AMOUNT OF TETRAETHYL LEAD AND HEAVY METALS IN CAR GASOLINE BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Genshi kyuko kodoho ni yoru jidosha gasorinchu no shiechirunamari ryo oyobi sonota jukinzoku ganryo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 3:196-202, March 1972. 6 refs.*

The amounts of tetraethyl lead, cadmium, copper, manganese, nickel, and zinc were measured by an atomic absorption spectrophotometer in two kinds of automobile gasoline. Five ml sample gasoline diluted with 100 ml of methyl isobutyl ketone to make the test solution for the determination of tetraethyl lead. Regular gasoline used in July contained 0.068 to 0.217 ml/l, or 0.112 ml/l on the average, of tetraethyl lead. Hi-octane gas used in July contained 0.133 to 0.300 ml/l, or 0.244 on the average. The regular gasoline used in September contained 0.066 to 0.184 ml/l, or 0.128 on the average, and the hi-octane gasoline contained 0.196 to 0.290 ml/l, or 0.128 on the average. Regular gasoline contained, on the average, 1.74 ppm of Ni, 0.057 ppm of Cu, 0.50 of Zn, and 0.49 of Cd, and 0.49 ppm of Mn. Hi-octane gasoline contained an average of 2.23 ppm of Ni, 0.42 ppm of Zn, 0.37 ppm of Cd, 0.2 ppm of Mn, and 0.042 ppm of Cu.

32729 **APTIC NO. 54792**

Starr, W. L. and M. Loewenstein

TOTAL ABSORPTION CROSS SECTIONS OF SEVERAL GASES OF AERONOMIC INTEREST AT 584 A. *J. Geophys. Res., 77(25): 4790-4796, Sept. 1, 1972. 23 refs.*

Total photoabsorption cross sections were measured at 584.3 A for nitrogen, oxygen, argon, carbon dioxide, carbon monoxide, nitric oxide, nitrous oxide, ammonia, methane, hydrogen, and hydrogen sulfide using a helium resonance lamp. A monochromator was used to isolate the He I 584 line produced in the lamp, and thin aluminum filters were used as absorption cell windows in order to eliminate possible errors associated with the use of undispersed radiation or windowless cells. The measured absorption cross sections were: 21.9, 22.7, 34.5, 36.4, 21.5, 25,7, 36.6, 28.1, 31.0, 6.19, and 29.2 respectively. The largest source of systematic error in the cross-sectional measurements was in the determination of the gas density. Random errors resulted in a computed standard error of 0.2% for each cross-sectional determination. Accurate absorption cross-sectional measurements are possible with windowless systems provided considerable care is exercised.

32730 **APTIC NO. 54658**

West, L. A. and G. A. Somorjai

REACTIVE SCATTERING OF N2O MOLECULAR BEAMS FROM CLEAN AND CARBON- COVERED (100) PLATINUM SINGLE-CRYSTAL SURFACES. *J. Vac. Sci. Technol., 9(2):668-672, March-April 1972. 16 refs.*

Thermal energy molecular beams of nitrous oxide have been scattered from a platinum (100) surface maintained in the temperature range 900-1500 K in a ultrahigh vacuum chamber. The angular distribution of the scattered beams was monitored with a quadrupole mass spectrometer, the target surface structure by low energy electron diffraction, and the surface composition by Auger spectroscopy. The effect of surface temperature and surface structure on the surface decomposition of N2O was studied. At 1200 K, using a clean surface, the angular distribution of one of the reaction products, nitric oxide, followed the cosine law, but deviations from this behavior occurred if the surface is covered by a layer of carbon. At still higher temperatures, N2O reacted with the carbon layer on the surface and removed it by an oxidation reaction giving carbon monoxide and nitrogen. The surface reaction of this interaction between N2O and surface carbon can be strongly exothermic, and hence evidence appears to have been detected for direct reactive scattering that has not been previously observed in surface reaction studies. (Author abstract modified)

32731 **APTIC NO. 54664**

Wiel, M. J. van der and Th. M. El-Sherbini

IONIZATION OF N2 AND CO BY 10 KEV ELECTRONS AS A FUNCTION OF THE ENERGY LOSS. II. INNER-SHELL ELECTRONS. *Physica, 59(3):453- 462, 1972. 20 refs.*

Oscillator-strength spectra were reported for the formation of nitrogen molecule (+), nitrogen ion (+) plus N2(+)(+) and N(+)(+), and carbon monoxide (+), CO(+)(+), carbon (+), oxygen ion(+), and C(+)(+) following Nk excitation in N2 and Ck excitation in CO. For promotion of a K electron to the first bound molecular level, broad absorption bands are observed both in N2 and CO, and are ascribed to vibrational excitation. For a comparison with photoabsorption data, it is inferred that the major fraction of K-ionization events leads to dissociation with excess kinetic energy of the fragments. No hydrogen-like jump is recorded at the K edges in N and C. The information obtained from these studies of N2 and CO is complementary to that from Auger-electron and photoelectron spectrometry. With N2, the conclusion that the promotion of a K electron to a bound molecular level gives rise to a wide band of vibrational excitation may be reconciled with the findings in Auger spectrometry; however, there is an evident discrepancy in the case of CO. (Author abstract modified)

32732 **APTIC NO. 54450**

Winterbottom, W. L.

QUANTITATIVE ANALYSIS OF THERMAL DESORPTION SPECTRA: CHEMISORPTION OF CARBON MONOXIDE ON TUNGSTEN. *J. Vac. Sci. Technol., 9(2):936-941, March-April 1972. 11 refs.*

Numerical analysis of the line shapes of thermal desorption spectra for carbon monoxide on polycrystalline tungsten was carried out. Within the beta phase there are at least six chemisorption substates; desorption from five of these states is a simple, first-order process. The desorption techniques is capable of resolving surface states whose heats of activation for desorption differ by as little as 4 kcal/mole. The experimental frequency factors for the five first order states increase with increasing activation energy. All the results can be interpreted as indicative of a highly directional bonding that is not closely related to the crystallographic anisotropy of the tungsten surface. (Author abstract modified)

32733 **APTIC NO. 54740**

Wong, S. F., T. V. Vorburger, and S. B. Woo

PHOTODETACHMENT OF O3 - IN A DRIFT TUBE. *Phys. Rev. A., 5(6):2598-2604, June 1972. 14 refs.*

The drift-tube photodetachment technique was used to measure the absolute photodetachment cross section and the solar photodetachment rate of O3-. The energy dependence of the cross section sigma was measured with the use of 18 color filters. By fitting the data with a least-squares program, it was found that sigma equals (alpha(E-3.0)+beta)H(E-Eo), where alpha equals 3.9-7.3 times 10 to the -19th power sq cm/eV, beta equals 7.1-10.3 times 10 to the -19th power sq cm, and Eo equals 1.89-2.09 eV. Eo is the threshold energy and H is the Heaviside step function. The solar photodetachment rate was 0.067-0.097/sec. The O3- ions were identified by mobility. (Author abstract)

32734 **APTIC NO. 54824**

Yalamov, Yu. I. and B. A. Obukhov

THE THEORY OF THE DIFFUSIOPHORESIS OF LARGE-SIZE, NON-VOLATILE AEROSOL PARTICLES. *(K teorii diffuzioforeza krupnykh neletuchikh aerozol nykh chastits). Text in Russian. Zh. Tekhn. Fiz., 42(5):1604-1608, 1972. 4 refs.*

Formula describing the rate of diffusiophoresis, in linear approximation regarding the concentration gradient of large, nonvolatile aerosol particles is presented. The convective effects, introduced in the diffusion equation, have no effect on the speed of the particles in a second approximation. The equation, as applied to the vapor-air binary system, gives a speed value in good agreement with experimental values. The results obtained by this formula are close to those furnished by the thermodynamic method. The formula contains dependences of molecular parameters such as molecular weight, diameter, coefficient of accommodation which are all ignored by the thermodynamic method.

32735 **APTIC NO. 54678**

Yates, John T., Jr. and David A. King

CHEMISORPTION OF CO ON TUNGSTEN (100): COMBINED FLASH DESORPTION AND ELECTRON STIMULATED DESORPTION STUDY. I. *Surface Sci., 32(3):479-505, 1972. 38 refs.*

The chemisorption of carbon monoxide on a tungsten (100) single crystal surface was studied at adsorption temperatures of 295 K and 195 K. A combination of flash desorption and electron stimulated desorption (ESD) techniques was used. In CO layers produced at 295 K, the alpha-CO state exists preferentially at higher alpha-CO coverages and is characterized by a predominant ion yield of CO(+) upon 100 eV electron bombardment. The alpha(2)- CO state yields O(+), and consists of a number of overlapping states possessing a range of desorption activation energies. During thermal desorption of alpha-CO, a stoichiometric state interconversion process occurs in which alpha(1)-CO converts to more strongly-held alpha(2)-CO as surface coverage decreases. Similar conversion behavior is observed when the surface layer is depopulated by ESD. Adsorption of CO at 195 K resembles adsorption at 295 K, except that a small additional alpha-CO state, designated alpha(0), and yielding CO(+) on ESD, is populated. Structural models are presented for alpha(1)-CO and alpha(2)-CO, and the role of the surface species structure in determining ionic fragmentation probabilities is discussed. (Author abstract)

1971

32736 **APTIC NO. 55131**

American Society for Testing and Materials, Philadelphia, Pa., Committee D-22 on Sampling and Analysis of Atmospheres

STANDARD RECOMMENDED PRACTICE FOR CONVERSION UNITS AND FACTORS RELATING TO ATMOSPHERIC ANALYSIS. *Book ASTM Stand., 1971:480-486, 1971.*

The results of air pollution measurement for evaluation and control activities are expressed in a variety of units originating in a number of different fields. At present, little standardization exists for the units used to report observations essential to air pollution control. Because of the variety of units used and the factors necessary to convert them to other units, it is impossible to find conversion factors that cover the entire field in any one publication. A tentatively recommended practice for conversion units and factors relating to atmospheric analysis is presented as a preliminary step in attempting to bring about essential standardization in this new field of testing. Factors are provided to change from units of measure in one system to related units in other systems as well as to smaller or larger units in the same system.

32737 **APTIC NO. 54281**

Kim, K. Y. and W. R. Marshall, Jr.

DROP-SIZE DISTRIBUTIONS FROM PNEUMATIC ATOMIZERS. *Am. Inst. Chem. Engrs. J., 17(3):575-584, May 1971. 28 refs.*

A study was made of the atomizing characteristics of convergent- type pneumatic nozzles. Drop-size correlations were obtained for the following ranges: drop size, 6 to 350 micron, mass median diameter; mass flow ratio, 0.06 to 40; relative velocity, 250 ft/sec to sonic velocity; and viscosity of 1 to 50 cp. The technique employed was to spray cool molten wax and melts of wax-polyethylene mixtures. The most important operating variables in pneumatic atomization are the dynamic force of the atomizing gas and the mass flow ratio of air to liquid. The cumulative volume drop-size distribution of spray from a pneumatic nozzle was fitted by a modified logistic equation. Empirical correlations developed in the study can be used to design nozzles or to predict drop size for sprays produced by the types of nozzles studied. In particular, this study provides new experimental data on the performance of pneumatic atomizers in producing relatively large drops. (Author abstract)

32738 **APTIC NO. 54838**

Lee, C. F.

ON THE SOLUTION OF SOME DIFFUSION EQUATIONS WITH CONCENTRATION- DEPENDENT DIFFUSION COEFFICIENTS. *J. Inst. Math. Its Appl., 8(2):251-259, 1971. 5 refs.*

An iteration method was developed based on analytical results for the numerical solution of a nonlinear differential system arising from a diffusion equation with concentration-dependent diffusion coefficients. The method was applied to the diffusion processes during the uptake of excess calcium by calcium fluoride. On the basis of the iteration method, a FORTRAN IV program for the GE-225 computer was designed for the numerical solution of the nonlinear differential system. It takes 2 to 3 min to obtain the numerical solution with an error estimate of less than 1%. (Author abstract modified)

32739 **APTIC NO. 54704**

Sharma, V. N., D. N. Tripathi, and D. K. Rai

ELECTRONIC IONIZATION AND RECOMBINATION COEFFICIENTS FOR ATMOSPHERIC MOLECULES -- I. ELECTRON IMPACT IONIZATION CROSS- SECTIONS. *J. Quant. Spectro. Radiative Transfer, 11(3):283-289, March 1971. 18 refs.*

Electron impact ionization cross-sections for the molecular atmospheric species nitrogen, oxygen, hydrogen, nitric oxide, carbon monoxide, and carbon dioxide have been calculated using different classical and semi-empirical formulas. The semi- empirical formula of Drawin with modified values of the parameters f1 and f2 (the amplitude parameter and form factor respectively) gave the best fit to the experimental data, though the unmodified Drawin and Gryzinski formulas also gave reasonable results, especially for the high-energy tails. The ionization cross-sections reached a peak for the incident energy range 100-120 eV for all molecules except hydrogen; for hydrogen the peak was at about 60 eV. Cross-sections calculated using the modified Drawin formula were used for the calculation of the ionization and recombination coefficients for an oxygen plasma, and comparison of the ionization rate coefficient with those of Lotz for an atomic oxygen plasma was quite satisfactory. The calculated recombination rate coefficient was of the same order as that measured in the laboratory for the other three-body reactions.

32740 **APTIC NO. 54448**

Takahashi, Ryoichi and Masuo Shindo

THEORETICAL STUDY OF TWO-PHASE FLOW OSCILLATION IN A HOT CHANNEL, (II). INFLUENCE OF HEAT TRANSFER CHARACTERISTICS ON THE FLOW STABILITY. *J. Nucl. Sci. Technol., 8(12):690-695, Dec. 1971. 6 refs.*

The influence of heat transfer characteristics on flow stability of two phase flow in a hot channel was examined with a simplified heat transfer model using conventional linear control theory. While numerically the influence of heat transfer characteristics on stability did not appear clearly in the analysis, it was possible to express in a block diagram the power feedback due to heat transfer characteristics. Moreover, the effect of heat transfer cannot be described by the usual single order system with a given time constant and parameter representing the effect of heat transfer. The level of the fluid column surface provided a stronger influence on the phenomena observed than the heat transfer. Even a slight change in the parameter which represents the magnitude of power feedback due to heat transfer characteristics influenced the calculated stability of two phase flow in a hot channel, though the effect of heat transfer on the stability given by the conventional feedback theory was not substantiated quantitatively.

32741 **APTIC NO. 54443**

Tripathi, G., G. N. Pandey, and P. C. Singh

RESIDENCE TIME DISTRIBUTION STUDIES ON DIFFERENT SYSTEMS: DERIVATION OF A GENERALIZED CORRELATION. *Indian J. Technol. (India), 9(8):281-284, Aug. 1971. 17 refs.*

The residence time distribution in glass columns, commercial pipes, and annuli in fixed and fluidized beds has been studied in order to establish a generalized correlation applicable to all systems. The experimental values of residence time in these flow vessels showed satisfactory agreement (within plus or minus 20%) with the values calculated using the following general correlation: mean residence time (tm) equals the length of a test section (L) divided by the superficial velocity (u) times the quantity (1 minus the dispersion number (D)). The correlation derived for fixed and fluidized beds can be expressed as tm equals the length of the test section void fraction divided by the superficial velocity times the quantity (1 minus the dispersion number). All of the values calculated for fixed and fluidized beds were lower than the experimental values, while the opposite held for glass columns, commercial pipes, and annuli. The discrepancy may be attributed to the effect of radial dispersion in fixed and fluidized beds. (Author abstract modified)

32742 **APTIC NO. 54688**

Venkatachalapati, M. V. and N. K. Roy

EFFECTIVE THERMAL CONDUCTIVITY OF POROUS BEDS FROM TRANSIENT HEAT CONDUCTION STUDIES. *Indian J. Technol. (India), 9(8):292- 296, Aug. 1971. 7 refs.*

The effective thermal conductivities of porous beds at atmospheric and subatmospheric pressures were determined from transient heat conduction studies with beds of glass beads, steel shots, lead shots, FT catalyst and silica gel particles in a specially designed spherical calorimeter. The reproducibility of the results obtained for different runs and the closeness of their fit with the theoretical model show that the apparatus is well suited to the determination of stagnant conductivities of porous beds. The effective conductivities are very low compared to pure solid conductivities, and their values decrease with increase in bed voidage at atmospheric pressure. The effective conductivities at subatmospheric pressures determined up to 10 mm Hg show rapid fall with decrease in pressure and when extrapolated to absolute zero pressure are independent of bed voidage. This constant vacuum conductivity at zero pressure may prove very useful in separating out the contribution of solid-solid conductivity from convective and radiative contributions to heat transfer in a porous bed under flow conditions for a more rational approach to design in such cases. (Author abstract modified)

1970

32743 **APTIC NO. 55023**

Ottinger, Ch. and R. N. Zare

CROSSED BEAM CHEMILUMINESCENCE. *Chem. Phys. Letters. (Amsterdam), 5(4):243-248, April 1, 1970. 25 refs.*

Chemiluminescence spectra from reactions of barium and calcium with nitrogen dioxide and nitrous oxide were observed. Sixteen bands were assigned to the barium oxide A 1 summation operator X 1 summation operator system for Ba and NO2. From this, a lower limit of 5.74 eV (133 kcal/mole) is placed on the BaO ground state dissociation energy. Barium + N2O shows a large angle nonreactive scattering while Ba + NO2 reacts at every collision (cross section is approximately greater than 150 A). An electron jump mechanism is proposed. (Author abstract)

1969

32744 **APTIC NO. 54304**

Neumann, Helmut

REACTION OF THE VICINAL DIOLS WITH DIMETHYLFORMAMIDE DIMETHYL ACETAL: A NEW METHOD OF PRODUCING EPOXIDES. *(Uber die Umsetzunz vicinaler Diole mit Dimethylformamide-dimethylacetal: eine neue Methode zur Bildung bon Epoxyden). Chimia, vol. 23:267-269, July 1969. 5 refs. Translated from German, 10p.*

The preparation of epoxides by the reaction of the vicinal diols with dimethylformamide dimethyl acetal is described. Trans-1,2-cyclohexanediol was converted into cis-cyclohexane oxide, 5 alpha, 6 beta-cholestanediol into alpha-delta 5-cholestene oxide and meso-hydrobenzoin into trans-stilbene oxide. The reaction proceeds via cyclic acetals. The dissociation product of the cyclic acetal is capable of being converted into the epoxide by a classical intramolecular SN reaction. It is in this step that the inversion would probably occur which is found from the stereochemistry of the isolated epoxides. The reaction with cis-cyclohexanediol does not yield an epoxide; the reaction proceeds no further than the cyclic acetal. In the case of D,L-hydrobenzoin, only the cyclic acetal is isolated. The apparatus employed for these experiments consisted of a round flask with two condensers placed one above the other. The lower condenser was heated with water from a recirculating thermostat connected to it (temperature between 60 and 80 C during the individual trials), while the upper condenser, cooled with tapwater, was designed so that the methanol liberated by transesterification could be collected.

1967

32745 **APTIC NO. 54730**

Brock, J. R.

EXPERIMENT AND THEORY FOR THE THERMAL FORCE IN THE TRANSITION REGION. *J. Colloid Interface Sci., 25(3):392-395, Nov. 1967. 12 refs.*

Experimental measurements of the thermal force by the Millikan cell method show that the thermal force data fit the following empirical relations exactly over the range of Knudsen (Kn) numbers greater than 0.2 and less than or equal to infinity: thermal force equals the thermal force in the free molecule region Kn (equal to infinity) times a constant, tau times the radius of the particle divided by the mean free path. For monatomic molecules, tau is approximately equal to 0.06 + 0.09 alpha + 0.28 alpha(1 alpha k sub f/2 k sub s). Alpha is the momentum accommodation coefficient for the particle-gas interaction, and k sub f and k sub s are the thermal conductivities of gas and particle, respectively. Based on certain assumptions, tau as it applies to polyatomic gases can be expressed as: 0.06 + 0.09 alpha + 0.28 alpha(1 Beta k sub f/2 k sub s), where beta is the thermal accommodation coefficient. Although this latter equation is by no means exact, there is no qualitative deviation between theory and experiment for polyatomic gases. Thus, the general form of the theoretical relations for tau as applied to aerosols in both monatomic and polyatomic gases appears to be correct.

EFFECTS-HUMAN HEALTH

1973

32746 **APTIC NO. 54203**

LUNG CANCER, AIR POLLUTION, AND SMOKING. *(Haigan to taiki osen to tabako). Text in Japanese. Nippon*

Ishikai Zasshi (J. Japan. Med. Assoc.), 70(5):541-542, Sept. 1973.

Of 122,850 cancer deaths in Japan, about half were due to lung cancer. Air pollution from industries and automobiles has probably increased the frequency of death from lung cancer. Smoking is a much greater factor in the development of lung cancer than air pollution. Smoking is harmful to both the smoker and to the nonsmoker in the same room with the smoker, that is, the passive smoker.

32747 **APTIC NO. 54864**

HYGIENIC GUIDE SERIES. TITANIUM. *Am. Ind. Hyg. Assoc. J., 34(6): 275-277, June 1973. 13 refs.*

An outline for hygienic standards, toxic properties, industrial hygiene practice, and medical information is provided for the element titanium. Atmospheric concentration immediately hazardous to life is unknown, though 10 mg/cu m of air total dust with less than 1% alpha-quartz is the TLV for titanium dioxide. Repeated inhalation of titanium oxide dust concentrations up to 328 million particles/cu ft of air for as long as 13 mo has resulted in generalized emphysema of the lungs, but with no specific lesion which suggested a pathological response. The metal is used in alloys, in the dyeing industry as a mordant, in commercial and military aircraft, and in missiles; titanium oxide is used in the paint industry as a pigment. Air samples can be analyzed by atomic absorption spectrophotometry, colorimetrically, spectrographically, or gravimetrically. Inhalation of high concentrations of titanium dust and fume should be avoided by ventilation, and extremely high concentrations of titanium dust may warrant the use of approved supplied air or self-contained breathing apparatus. Ducts conveying titanium aerosols should have short straight sections with conveniently located cleaning doors, and dust collectors should not be connected to other ventilation systems.

32748 **APTIC NO. 54976**

Alarie, Yves, Robert J. Kantz, II, Charles E. Ulrich, Alexis A. Krumm, and William M. Busey

LONG-TERM CONTINUOUS EXPOSURE TO SULFUR DIOXIDE AND FLY ASH MIXTURES. IN CYNOMOLGUS MONKEYS AND GUINEA PIGS. *Arch Environ Health, 27(4):251-253, Oct. 1973. 15 refs.*

Three groups of cynomolgus monkeys and three groups of guinea pigs were exposed to mixtures of sulfur dioxide (SO2) and fly ash, while one group of each species was used as a control group. The exposure concentrations for SO2 were 0.1, 1.0, and 5 ppm, and 0.5 mg/cu m of fly ash was combined with each of the SO2 concentrations. The duration of exposure was 52 weeks in guinea pigs and 78 weeks in monkeys. Pulmonary function tests and serum biochemical and hematological analyses were conducted prior to and during the exposure period. At termination of exposure, microscopic examination of the lung was performed. No adverse effects in guinea pigs or monkeys could be attributed to synergistic effects from exposure to SO2 and fly ash. (Author abstract modified)

32749 **APTIC NO. 55266**

Alarie, Y., I. Wakisaka, and S. Oka

SENSORY IRRITATION BY SULFITE AEROSOLS. *Environ. Physiol. Biochem., vol. 3:182-184, 1973. 8 refs.*

Sensory irritation of sulfite and bisulfite anions were differentiated by exposing mice to aerosols of sodium sulfite and sodium metabisulfite. Sensory irritation to the upper respiratory tract was measured. Sodium sulfite was inactive, but Na2S2O5 evoked sensory irritation in a fashion comparable to sulfur dioxide. Sensory irritation is due to the presence of the bisulfite anion formed in the slightly alkaline pH of the nasal mucosa when animals are exposed to sodium metabisulfite or SO2. (Author abstract modified)

32750 **APTIC NO. 54214**

Asmundsson, Tryggvi, Kaye H. Kilburn, and Wayland N. McKenzie

INJURY AND METAPLASIA OF AIRWAY CELLS DUE TO SO2. *Lab. Invest., 29(1):41-53, July 1973. 42 refs.*

Injury and metaplasia of airway cells due to sulfur dioxide were investigated in Sprague Dawley rats and Syrian hamsters. Abrupt exposure to 400 ppm of SO2 caused death within 6 hr to 22 of 30 rats and six of six hamsters. It was difficult to assign the damage which was observed in survivor rats to SO2 because patchy pneumonia was seen and pathogenic bacteria were grown from many tracheas or lungs. Because of these problems, hamsters were used and SO2 was given at lower levels or with a gradual increase in levels. Hamsters had pneumonia rarely and bacterial cultures of lung and trachea were usually sterile. A sequence of epithelial changes were seen in the trachea and large bronchi with exposure to 100, 200, or 400 ppm for up to 6 wk. At 200 ppm there was loss of cilia, bacuolation, pyknosis, and extrusion of cells after 1 to 2 days; only transient goblet cell hyperplasia after 3 to 4 days; basal cell hyperplasia and the development of stratified squamous epithelium in 6 to 8 days; and squamous metaplasia after 2 to 4 wk. Higher doses (400 ppm) produced squamous metalplasia after 1 to 2 wk. Goblet cell metaplasia appeared to be a brief phase in the response to damage which produces squamous metaplasis. Exposure to 40 ppm SO2 alone for 4 hr/day for 6 wk produced no changes, but 24 hr after a 4-hour exposure to 40 ppm SO2 plus 0.74 g of carbon dust/cu m of air, neutrophils were recruited into airway epithelium. It is suggested that this synergistic effect is due to the C particles absorbing SO2, which leaches off slowly, perhaps within macrophages, to recruit leukocytes in airways. (Author abstract modified)

32751 **APTIC NO. 55276**

Beg, M. U., Qamar Rahman, P. N. Viswanathan, and S. H. Zaidi

THE EFFECT OF ASBESTOS DUST ON MITROCHONDRIAL ENZYMES OF RAT LUNG. *Environ. Physiol. Biochem., vol. 3:185-191, 1973. 21 refs.*

The effect of amosite, anthophyllite, and chrysotile varieties of asbestos on the activity of some mitrochondrial enzymes was studied in vitro and in vivo in the rat lungs. Cytochrome c oxidase, diaphorase, and adenosine triphosphatase were the targets of asbestos toxicity. The in vitro studies showed inhibition of cytochrome c oxidase, but in vivo there was activation. Anthophyllite had no apparent effect on enzymes, but chrysotile and amosite were most effective on enzyme activity. (Author abstract)

32752 **APTIC NO. 54421**

Bonaventura, Celia, Joseph Bonaventura, Eraldo Antonini, Maurizio Brunori, and Jeffries Wyman

CARBON MONOXIDE BINDING BY SIMPLE HEME PROTEINS UNDER PHOTODISSOCIATING CONDITIONS. *Biochemistry, 12(18):3424-3428, Aug. 28, 1973. 13 refs.*

The binding of carbon monoxide in the presence of photodissociating light by several simple heme proteins was investigated. The proteins are sperm whale myoglobin, Aplysia myoglobin, horseradish peroxidase, Chironomus hemoglobin, isolated alpha, beta chains of human hemoglobin A, and Gastrophilus hemoglobin. In the presence of light, the CO binding curve maintains the shape of the simple (noncooperative) titration observed in the dark. The apparent dissociation constant, given by c 1/2, shifts as a linear function of light intensity. Unfiltered light from the 150 W xenon arc increases the value of c 1/2 by about 1000 fold for sperm whale myoglobin. The kinetics of approach to the steady state when the light is turned on and the return to equilibrium when it is turned off conforms to a simple one step process. In relaxation experiments involving small perturbations of the steady state, the relaxation is linear in the sum of the concentrations of the reactants (iron and CO) for any given light intensity, which agrees with the idea that the CO combination rate constant (1 prime) is unaffected by light. The value of 1 tau/at ((Fe) + (CO)) equals 0 is a linear function of light intensity, as expected on simple grounds. The quantum yield is temperature independent. Photodissociation acts in addition to, and independently of, the dissociation process which occurs in the dark (1). (Author abstract modified)

32753 **APTIC NO. 54474**

Brilinskiy, L. I.

DATA FOR SUBSTANTIATING MAXIMUM PERMISSIBLE CONCENTRATIONS OF ELEMENTAL SULFUR DUST IN THE AIR OF INDUSTRIAL BUILDINGS.

In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 78-80, APTD-1366. Translated from Russian. (Also: Zdorovya, 1969:165-167, 1969.)

NTIS: PB 214264

The biological effect of elemental sulfur on the organism of experimental animals was studied in order to substantiate its maximum permissible concentration (MPC). The first experimental group was exposed to sulfur ore dust in a concentration of 4.5 mg/cu m, the second to 11.2 mg/cu m, and the third to 30.8 mg/cu m. The fourth group was subjected to inhalation of pure elemental S dust in a concentration of 8.6 mg/cu m. The morphological composition of the blood, activity of blood enzymes, catalyse and peroxidase, and the content of sulfhydryl and blood sugar were investigated under dynamic conditions in all the animals. The ascorbic acid content of the vital organs in the second group was also determined. A statistically significant 43.0% decrease in weight gain took place in the animals of group III. Sulfur in doses of 8.6, 11.2, and 30.8 mg/cu m of air caused a 10.7-20.5% decrease in sulfhydryl groups. A decrease in peroxidase activity was noted in groups II and IV, at a statistically significant 12.3-12.9%. The rats in group III suffered a 13.1% depression. No appreciable changes were detected in the activity of blood catalase. A disturbance in the protein synthesis in the liver was indicated by an increase in the content of total protein in groups II, III, and IV, with a percentage of 4.5-8.1. Therefore, a sulfur dust concentration of 10 mg/cu m in air, which is the present MPC, is harmful to the organism, and should be decreased. The MPC of elemental S dust in the air of industrial buildings should be a level of 2 mg/cu m.

32754 **APTIC NO. 54743**

Burton, Robert M., Walter M. Kozel, Robert L. Penley, George H. Ward, and Robert S. Chapman

APPLICATION AND EVALUATION OF PORTABLE FIELD INSTRUMENTS FOR MEASURING FORCED EXPIRATORY VOLUME OF CHILDREN AND ADULTS IN ENVIRONMENTAL HEALTH SERVICES.

Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 24p., Jan. 9, 1973. 3 refs.

Laboratory and field pulmonary function testing have shown that the waterless mechanical volume sensing spirometer coupled with automatic electronic readout pneumotachs and hot wire anemometers is superior for large numbers of field pulmonary function tests where instrumentation must be moved constantly during testing. This system can be calibrated in the laboratory with a primary standard before testing sessions begin, and can be checked at any time during testing by utilizing the mechanical indicator located on the spirometer. The system is light-weight, portable, durable, and simple to operate. (Author summary)

32755 **APTIC NO. 55259**

Castleman, W. L., D. L. Dungworth, and W. S. Tyler

CYTOCHEMICALLY DETECTED ALTERATIONS OF LUNG ACID PHOSPHATASE REACTIVITY FOLLOWING OZONE EXPOSURE.

Lab. Invest., 29(3):310-319, Sept. 1973. 28 refs.

Lung acid phosphatase and beta-glucuronidase localizations were studied histochemically and cytochemically after young rats were exposed to 0.7 to 0.8 ppm ozone continuously for 7 days. In ozone exposed lungs an increase in acid phosphatase histochemical reactivity was observed in the terminal airway epithelium and adjacent interalveolar septa in the proximal portion of the pulmonary acinus. The major histologic alterations in these proximal acinar regions were interstitial thickening and leukocytic infiltration. The infiltrate was predominantly composed of nononuclear cells. Alveolar macrophages distributed throughout the acinus on ozone exposed lungs were observed to have increased acid phosphatase reactivity. Similar increases in beta-glucuronidase reactivity were not observed. Acid phosphatase localization at the ultrastructural level in control lungs indicated that this enzyme was distributed only in lysosomes and other elements of the vacuolar apparatus. Enzyme localization in ozone-exposed lungs indicated that acid phosphatase had a nonvacuolar, as well as vacuolar, intracellular distribution as was evidenced by a freely dispersed cytoplasmic distribution of reaction product in nonciliated bronchiolar epithelial (Clara) cells, alveolar macrophages, membranous and granular pheumonocytes, and fibroblasts. The results are in agreement with the hypothesis that ozone exposure results in damage to lung lysosomal membranes. (Author abstract)

32756 **APTIC NO. 55292**

Chiba, Y., I. Sado, K. Otsu, K. Momozaki, T. Miyazaki, K. Yamamoto, and S. Shiobara

INFLUENCE OF AIR POLLUTION ON THE HEALTH OF INHABITANTS IN A MIDDLE SCALE CITY, PART II. RESPIRATORY DISEASES IN BABIES AND CHILDREN.

(Chusho-toshi ni okeru taiki osen no jumin no kenko ni ataeru eikyo, sono 2, gakudo no kokyuki shikkan). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10):515, Oct. 1973. (Presented at the Japan Society of Public Health, Annual Meeting, 32nd, Oct. 1973.)

Soka city has several main roads and a number of industries which cause air pollution. During 1971, 55% of the complaints about the roads concerned air pollution. The concentration of sulfur dioxide was above the environmental standard from April 1971 to March 1972. Air pollution concentrations were nearly those of larger industrial cities. Babies and children were studied by questionnaires answered by their parents. Twenty percent of the primary schoolchildren had bronchial asthma histories. Existing asthmatic diseases occurred in 6% of the primary schoolchildren and 12.58% of the nursery schoolchildren. Asthmatic attacks varied with season.

32757 **APTIC NO. 54293**

Connolly, Charles H.

AIR POLLUTION AND PUBLIC HEALTH.

2nd ed., New York, Dryden Press, 1973, 279p. 444 refs.

Summaries of current research on the health aspects of air pollution are presented. The topics include: environment and public health, understanding air pollution, carbon monoxide, particulate matter, nitrogen oxides, hydrocarbons, photochemical oxidants, sulfur oxides, the air and pollution, policy makers, and the public. Two facts are established: science has only a sketchy and uncertain knowledge of the health effects of the air and ambient air levels do not appear to pose an immediate threat to health. The adverse cost-benefit ratio and lack of validated scientific evidence about the health effects of automotive emissions in relation to the 1975-1976 Federal automotive emission standards are summarized.

32758 **APTIC NO. 54473**

Datsenko, I. I.

METABOLIC REACTIONS IN THE PRESENCE OF CHRONIC INTOXICATION WITH CARBON MONOXIDE. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 75-77, APTD-1366. Translated from Russian. (Also: Zdorovya, 1970:146-149, 1970.)*

NTIS: PB 214264

The quantitative content of cholesterol in the blood in the presence of chronic intoxication with carbon monoxide was studied. Fifteen white rats were subjected to chronic 5 hr/day exposure to CO in a concentration of 0.009-0.018 mg/l in the air for 1.5 mo. The concentration was elevated to 0.030-0.040 mg/l for another 3 mo, and finally to 0.080-0.100 mg/l for the last month. Five guinea pigs were subjected to exposure with a concentration of 0.030-0.040 mg/l of CO. Data show that amounts of hemoglobin, erythrocytes, leukocytes, and the differential white blood count indices did not differ appreciably from the control animals. The average values of the total cholesteral, in contrast, were higher than in the controls, and average 163 plus or minus 2.65, versus 153 plus or minus 2.68 mg %. However, hyperlipemia was observed under the influence of minute concentrations of CO. The data obtained on the cholesterol content of the blood and the presence of carboxyhemoglobin in the blood of the experimental animals attested to the change in metabolic processes in the organism in the presence of chronic CO intoxication. Carbon 'monoxide seems to have a considerable influence on the development of athersclerotic symptoms in the organism.

32759 **APTIC NO. 55[illegible]2**

Datsenko, I. I., T. M. Hladyshevska, Le Tchi Tchoa, and B. A. Sobchuk

MYOGLOBIN DURING CARBON MONOXIDE POISONING. *(Miohlobin pry otruyenni orhanizmu okysom vuhletsyu). Text in Ukrainian. Ukr. Biokhim. Zh., 45(2):146-150, 1973. 11 refs.*

Formation of carboxyhemoglobin (HbCO) and carboxymyoglobin was studied in rats in equilibrium diffusion with CO pressure of 0.076-0.760 mm of Hg. The CO saturation of Hb and Mb increased with an increase in partial CO pressure from 0.076 to 0.570 mm of Hg. The HbCO level in the blood increased to a maximum from 1-55% and MbCO in muscles, from 0-27%. This level was maintained during further increases in CO concentration. Formation of MbCO in muscles was linearly dependent on HbCO content in the blood with MbCO forming only when HbCO level reached 10%. Relative distribution of CO between Mb and Hb (% MbCO/% HbCO) was a constant value, 0.45. The HbCO level in healthy humans may be 3-20% and can cause MbCO formation in muscles and the myocardium. Formulas for calculating the equilibrium of CO distribution in the body and partial CO pressure are given.

32760 **APTIC NO. 54477**

Dubrovskaya, F. I. and M. Kh. Khachaturyan

SANITARY EVALUATION OF VALERIC ACID AS AN ATMOSPHERIC POLLUTANT. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology 1973, p. 98-103, APTD-1366. 8 refs. Translated from Russian. (Also: Uchenye Zapiski, 1968:10-15, 1968.)*

NTIS: PB 214264

The maximum permissible concentration of valeric acid in the air was determined by measuring its threshold of olfactory perception and then by studying the influence of low concentrations of the substance on the reflex change of light sensitivity in the eye and electrical activity of the brain in man. The threshold of olfactory perception of CH3(CH2)3COOH vapor for the most sensitive subject was 0.09 mg/cu m. The study of the reflex effect of valeric acid vapor established that the light sensitivity of the eye changes at a concentraiton of 0.5 mg/cu m, and that concentrations from 0.49 mg/cu m caused no significant deviations. Changes in the electrical activity of the cerebral cortex were recorded during the inhalation of a concentration of 0.07 mg/cu m, and a concentration of 0.034 mg/cu m was inactive. Therefore, the highest single maximum permissible concentration of CH3(CH2)3COOH for atmospheric air which can be recommended to 0.03 mg/cu m. (Author conclusions modified)

32761 **APTIC NO. 54916**

Eads, Ewin A. and Charles E. Lambdin

A SURVEY OF TRACE METALS IN HUMAN HAIR. *Environ. Res., vol. 6:247-252, 1973. 9 refs.*

Concentrations of lead, mercury, cadmium, zinc, nickel, copper, and manganese in the hair of male and female subjects from the industrial city of Port Arthur, Texas were determined. Reasonably close agreement existed between the determined values and published values from Hanover, N. H. except for lead. Lead values from Port Arthur subjects averaged about 36% higher than the subjects living in Hanover. This is attributed to the higher airborne lead content in a gasoline production center. A trend of increasing lead content with age was observed for males, while females (aged 37-72 yr) showed a decline of lead, cadmium, zinc, copper, and mercury. The lead decline for women was attributed to lower airborne lead in residential areas away from the refineries since few women are employed in gasoline production. Copper and zinc values for both sexes appeared to be related to hair pigmentation.

32762 **APTIC NO. 54874**

El-Gazzar, R., Yassin M. El-Sadik, and M. Hussein

CHANGES IN ZINC AND SERUM PROTEINS DUE TO CARBON DISULPHIDE EXPOSURE. *Brit. J. Ind. Med. (London), 30(3):284-288, July 1973. 25 refs.*

Serum zinc and proteins were studied in 82 middle-aged male workers in the Egyptian rayon industry. Forty of these workers were being exposed on their jobs to carbon disulfide (5 to 105 ppm), and nine had been exposed to similar levels in the past for a year or more; the remaining 33 men served as unexposed controls. The mean serum zinc level of the currently exposed subjects was 69 micrograms %, while that of the previously exposed subjects was 87.8 micrograms %, while that of the controls was 94.7 micrograms %. The difference between the serum zinc levels of the currently exposed subjects and controls in significant, as is that between those who were currently exposed and those who had been previously exposed. The rate of zinc excretion in the urine was significantly higher among the currently exposed men than among the controls and previously exposed men. There was no correlation between the duration of exposure and either the serum zinc level or rate of excretion in the urine. The total of serum proteins, albumin, and beta and gamma globulins was significantly higher among currently exposed men than among controls. The previously exposed subjects had significantly higher total serum protein and gamma globulin levels than the controls. Exposure to CS2 decreases zinc levels in the serum, increases the excretion of zinc in the urine, and increases both the globulin and albumin fractions of the serum protein; the the exceptin of those associated with the globulin fractions, these changes are transient. (Author abstract modified)

32763 **APTIC NO. 54493**

Ferin, J. and L. J. Leach

THE EFFECT OF SO2 ON LUNG CLEARANCE OF TIO2 PARTICLES IN RATS. *Am. Ind. Hyg. Assoc. J., 34(6):260-26[illegible], June 1973. 13 refs.*

By use of the nontoxic-particle-challenge system, the integrated alveolar clearance was measured in 420 male Long-Evans rats by serially sacrificing them after exposure to Titanium dioxide aerosol and determining the amount of TiO_2 retained in the lung. Prior to exposure to TiO_2, groups of animals were exposed to 0.1, 1.0, or 20 ppm of sulfur dioxide for 7 hr/day, 5 days/wk for a total exposure of 70 to 170 hr. The results indicate that SO_2 affects the clearance of inert particles. The lowest exposures showed slight stimulation or no effect on clearance, whearas a depression in clearance was observed after 170 hr of exposure at 1 ppm. Short-term exposure at higher concentrations appears to be tolerated better than longer exposure at low concentrations. (Author abstract)

32764 **APTIC NO. 54480**

Fomin, A. P.

EFFECT OF LOW CONCENTRATION OF EPICHLOROHYDRIN VAPOR ON THE ANIMAL ORGANISM. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 118-124, APTD-1366. 11 refs. Translated from Russian. (Also: Uchenye Zapiski, 1968:50-56, 1968.)*

NTIS: PB 214264

In order to determine the maximum permissible concentration of epichlorohydrin, four groups of 15 rats each were tested for their condition and weight, change in latent time of unconditioned reflex reactions, blood cells, nucleic acids, coporphyrin in the urine, and histopathology under different concentrations of CH_2OCHCH_2CL. Numerical data was subjected to statistical treatment by the range method. In a concentration of 20 mg/m in chronic inhalation exposure, CH_2OCHCH_2CL causes functional disturbances and morphological changes in tissues of the internal organs and in the central nervous system. A CH_2OCHCH_2CL concentration of 2 mg/cu m under the same conditions of exposure affected only certain physiological reactions of the organism. A mean daily maximum permissible concentration of CH_2OCHCH_2CL of 0.2 mg/cu m is recommended in atmospheric air, as this concentration was inactive in chronic exposure of the experimental animals. (Author conclusions modified)

32765 **APTIC NO. 54932**

Frankland, A. W. and P. H. Gregory

ALLERGENIC AND AGRICULTURAL IMPLICATIONS OF AIRBORNE ASCOSPORE CONCENTRATIONS FROM A FUNGUS, DIDYMELLA EXITIALIS. *Nature (London), 245(5424):336-337, Oct. 12, 1973. 10 refs.*

One hundred patients with seasonal symptoms of rhinitis and/or asthma were tested with extracts of two isolates of Didymella exitialis ascopores from barley leaves. Four reacted to both extracts and eight gave a positive reaction to one of the ascopore extracts. Eleven of the 12 patients who reacted were already being treated for a mold spore asthma due to Alternaria of Cladosporium. One of these patients was admitted to the hospital in severe status asthmaticus at a time of high ascospore counts. Some patients with seasonal symptoms that seemed to be associated with barley had negative immediate skin tests, but one had positive precipitating antibodies present, indicating that these ascospores could also cause a disease of the farmer s lung type, caused by a Type III reaction of Gell and Coombs. In addition to its possible role as an aero-allergen, there is a question of whether D. exitialis, which is implicated as a cause of leaf scorch of cereals in Switzerland, damages cereal crops in England.

32766 **APTIC NO. 54286**

Friberg, Lars, Magnus Piscator, Gunnar Nordberg, and Tord Kjellstrom

CADMIUM IN THE ENVIRONMENT, II. *Karolinski Inst., Stockholm (Sweden), Dept. of Environmental Hygiene, Environmental Protection Agency Contract 68-02-0342, EPA-R2-73-190, 150p., Feb. 1973. 190 refs.*

NTIS: PB 221198

The toxic action of cadmium and the relationship between exposure and effects on human beings and animals are reviewed. Epidemiological investigations in cadmium-polluted areas of Japan are also reviewed, and a theory of the etiology of itai-itai disease based on a vitamin D deficiency is presented. In a study of five human beings, it was shown that 4.7-7% of radioactive Cd is retained in the body after ingestion. Assuming that the influence of Cd deficiency is of the same magnitude in human beings as in animals, it is conceivable that absorption rates in excess of 10% must be considered. New data indicate that after short term exposure to high amounts of Cd, the initial decrease in blood levels is fast. Renal cortex levels of Cd at age 50 are about 20-30 ppm wet weight in Europe. In Japan, there is a concentration of 125 ppm. Levels of around 25 ppm are found in the United States. In normal human beings the excretion of Cd via the urine is very low, around 2 micrograms or less. Urinary excretion increases with age, at about the same rate as the total body burden. Even when there is only a slight tubular dysfunction as indicated by moderate increases in excretion of low molecular weight proteins, there will be an increase in the excretion of Cd. (Author summary modified)

32767 **APTIC NO. 54175**

Frost, Douglas V.

THE SELENIUM CYCLE AND Health. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 29p., 1973. 38 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-52.)*

The nutrient essentially of selenium and how its deficiency occurs are discussed. Selenium steadily emerged after 1956 as a critically essential nutrient. It is needed with vitamin E or other antioxidants. In unison with the ubiquinones and other complex lipids in cell organelles, Se and vitamin E apparently act as catalysts for energy conversion and help regulate metabolism in many tissues. Senenium appears to function as the very active and unstable selenide, Se(-2) ion, in nonheme iron containing proteins in cell membranes. It plays a role in protein synthesis via Se trisulfides (S-Se-S, possibly involving t-ribonucleic acid). Eastern soils have more total Se than western soils, but the Se in the acidic eastern soils is largely unavailable, while the Se in alkaline soils of the west is available. Sulfur dioxide converts selenium oxide to unavailable Se and is itself converted to the acidic sulfate ion. The availability of Se in soils appears to be diminishing in the already low Se areas. This may account for reported increases in Se deficiencies in farm and zoo animals. Increased acidification of water and soils by SO_2 and nitrogen dioxide may be contributing factors. The Se in plants, animal tissues, human blood, and cow s milk are all reatively low in the Se deficiency areas. Measurement of changes in the level and availability of Se in soils and foods to establish the significance of Se deficiency is recommended. Positive attitudes toward experimentation with Se to evaluate its significance for human health are needed. (Author abstract modified)

32768 **APTIC NO. 54467**

Gildenskiold, R. S., Ya. K. Yushko, G. N. Tyurina, and V. P. Dukhanova

STUDY OF THE HEALTH OF THE JUVENILE POPULATION RESIDING IN AREAS WITH VARIOUS DEGREES OF POLLUTION OF THE ATMOSPHERE

BY EMISSIONS FROM STATE REGIONAL ELECTRIC POWER PLANTS (SREPP). *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, 1973, p. 47-52, APTD-1366. 1 ref. Translated from Russian. (Also: Uchenye Zapiski, 1968:75-80, 1968.)*

NTIS: PB 214264

Emissions from a State Regional Electric Power Plant were studied in order to determine the concentrations of pollutants. In a 20 km radius, three distinct zones were found. The throwover zone, located 800-1200 m from the stack, has the bulk of the toxic substances continually diluted in the atmosphere and transported by air masses to a certain distance away. The smoke pollution zone, where the largest amount of sulfur dioxide and dust settle to the ground in 800-1200 m from the stack. The control zone is the area where dispersion decreases ground concentrations and it is located 20 km away. A biochemical, anthropological, clinical, and physiological survey of children living in the area showed that 63.9% of the health complaints come from the smoke pollution zone, 43.0% come from the throwover zone, and that 30.1% come from the control group. This survey proves that conditions debilitating to the health of children exist in the smoke pollution zone, where the highest singlefold concentration of SO2 and fly ash exceed the maximum permissible concentrations. This clinical confirmation of the throwover zone of the plume also makes it possible to recommend planned layouts of the residential settlement near an isolated SREPP.

32769 **APTIC NO. 54342**

Governa, M. and C. Rosanda Vadala

HISTOCHEMICAL STUDY OF ASBESTOS FIBRE COATING IN EXPERIMENTAL CARRAGEENIN GRANULOMAS. *Brit. J. Ind. Med. (London), 30(3):248-252, July 1973. 12 refs.*

To study the composition of asbestos body coating, asbestos particles present in experimental carrageenin granulomas of guinea pigs were tested histochemically for mucopolysaccharides, ferric and ferrous iron, hemoglobin, and hematoidin. The stains were applied to microscopic sections which had been either untreated or treated with iron extracting solutions and/or enzymes. The results indicate that asbestos is rapidly coated with hematoidin, ferric iron, and hyaluronic acid. (Author abstract)

32770 **APTIC NO. 54782**

Granick, J. L., S. Sassa, S. Granick, R. D. Levere, and A. Kappas

STUDIES IN LEAD POISONING: II. CORRELATION BETWEEN THE RATIO OF ACTIVATED TO INACTIVATED DELTA-AMINOLEVULINIC ACID DEHYDRATASE OF WHOLE BLOOD AND THE BLOOD LEAD LEVEL. *Biochem. Med., 8(1): 149-159, Aug. 1973. 11 refs.*

Aliquots of 5 microliters of heparinized blood may be used to determine the activity of delta-aminolevulinic acid dehydratase in aliquots incubated with delta-aminolevulinic acid and in aliquots incubated with delta-aminolevulinic acid plus dithiothreitol. The log of the activity of delta-aminolevulinic acid dehydratase in the absence of dithiothreitol is inversely correlated with the blood lead level with a correlation coefficient of 0.72. The ratio of dithiothreitol activiated enzyme to nonactivated enzyme, versus the blood level gives a linear regression line with a correlation coefficient of 0.8. Dithiothreitol (20 mM) fully activates the enzyme in lead poisoned blood to the levels of activated normal blood. Thus, lead in quantities less than or equal to 0.09 mg/100 ml of blood does not appear to inhibit the formation or affect the destruction of delta-aminolevulinic acid dehydratase. Kinetic analysis indicates that lead changes the affinity of the dehydratase for delta-aminolevulinic acid slightly, but that it markedly lowers the Vmax, indicating that the inhibition is primarliy of the noncompetitive type. (Author summary)

32771 **APTIC NO. 54919**

Gross, Paul and Russell A. Harley, Jr.

THE LOCUS OF PATHOGENICITY OF ASBESTOS DUST. A THEORY. *Arch. Environ. Health, 27(4):240-242, Oct. 1973. 8 refs.*

Uncontested documented experimental findings as well as data from some preliminary experiments on rats point to a sharp difference in pathogenicity between polyfilamentous asbestos dusts on the one hand and monofilamentous dusts on the other and to a significant reduction in the pathogenicity of asbestos dust when its particles are rendered monofilamentous either by grinding or by thermal fusion of fibris. Experiments dealing with the reduction of pathogenicity by chemical fusion of fibrils were performed on rats. Lead silicate and ferric silicate-cemented asbestos were injected intratracheally, and the lungs were examined three months afterward. The predominant pulmonary lesion produced by the lead-cemented asbestos was minimal in character, consisting of prominent giant cells, a few histiocytes, little reticulin, and no collagen fibers. Lesions produced by the unaltered asbestos consisted of collagen as well as reticulin fibers and histiocytes. Iron silicate was less effective in reducing the pathogenic potential of chrysotile than was lead silicate. In vitro studies indicated that lead silicate-cemented crocidolite caused only 30% hemolysis of human red blood cells, whereas the unaltered crocidolite caused 100% hemolysis.

32772 **APTIC NO. 54463**

Gusev, M. I. and Ye. V. Yelfimova

FERROUS METALLURGY AS A SOURCE OF ATMOSPHERIC POLLUTION. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 22-26, APTD-1366. Translated from Russian. (Also: Uchenye Zapiski. 1968:5-9, 1968.)*

NTIS: PB 214264

Three ferrous metallurgical plants were studied in order to quantify their discharges of phenol and sulfur dioxide. In the first plant studied, at a distance of 3 km, the SO2 concentration was 11 times greater than the maximum permissible concentration (MPC), and the C6H5OH was many times higher. The second plant had a discharge of 1.6-1.2 times the MPC for SO2, and 30-38 times greater for C6H5OH, at 500 m. The last plant showed the highest concentration of SO2 at 3 km, which was 5.2-3.8 times greater than the MPC. The concentration of C6H5OH was 18-7 times greater than the MPC in the 3000 m zone. In connection with the start of nitrogen fertilizer production in this plant, a second analysis was performed to measure the ammonia content of the air. An increase of 8.5 times the preceding year was noted. The high concentration of industrial pollutants precipitated an examination of this influence upon human health. One hundred and eighty-five adults complained of unpleasant odors which caused headache, coughs, difficult breathing, and eye irritation, especially in the early morning or evening hours, and during cloudy, windy, or fall weather. Industrial dust was also a problem. A medical survey showed that the total number of illnesses in the main group was twice as high as in the control group, and that upper respiratory problems were 2.5 times higher. Sulfur dioxide was present in the blood in amounts varying from traces to 0.06 mg. A prevalence of central nervous system disorders and a lag in physical development was noted in children from the polluted neighborhood. These results show the importance of instituting and enforcing the MPC for ferrous metallurgical plants.

32773 **APTIC NO. 54472**

Gusev, M. I. and A. A. Minayev

DETERMINATION OF LATENT TIME OF REFLEX REACTIONS OF LABORATORY ANIMALS ACTED UPON BY TOXIC AGENTS IN ATMOSPHERIC AIR. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 772-774, APTD-1366. 4 refs. Translated from Russian. (Also: Ucheney Zapiski, 1968:24-26, 1968.)*

NTIS: PB 214264

Measurement of the latent time of reflex reactions, a sensitive indicator of the functional state of the nervous system and thus a reflection of its changes, was used to determine the sanitary standardization of toxic substances in the atmospheric air. Studies of the change in the latent time of the defensive unconditioned reflex reaction were made once a week at the same hour on five rats of each group. The results were processed by variational statistics, sigma being found by the range method. Active concentrations were 5.0 mg/cu m for alpha-methylstyrene, 20.0 mg/cu m for epichlorohydrin, 20. mg/cu m for ammonia, and for the combined action of phenol and sulfur dioxide, 0.05 mg/cu m and 0.5 mg/cu m, respectively. The observed variations of the functional state of the central nervous system in the animals under the influence of chronic inhalation of these toxic substances, present in the atmospheric air, were confirmed by changes in the activity of cholinesterase, changes in the content of nucleic acids of the blood impairment of the excretion of coproporphyrin in the urine, and pathomorphological changes in the central nervous system.

32774 **APTIC NO. 549444**

Hagerstrand, I. and B. Seifert

ASBESTOS BODIES AND PLEURAL PLAQUES IN HUMAN LUNGS AT NECROPSY. *Acta Pathol. Microbiol. Scand., Sect. A, 81(4):457-460, 1973. 22 refs.*

Ninty-seven, largely consecutive, subjects (59 men and 38 women) in Malmo, a coast town of 250,000 inhabitants in south Sweden, were examined post mortem for pleural plaques and asbestos bodies of the lungs. Two sections and one smear from each lung were examined. Asbestos bodies were found in 47 (32 men and 15 women) and pleural plaques in 29 (26 men and 3 women). Sixteen out of the 32 men with asbestos bodies also had pleural plaques. In seven subjects, all men, more than 20 asbestos bodies were found; four of these had pleural plaques. (Author abstract)

32775 **APTIC NO. 54744**

Hasselblad, Victor and William Nelson

ADDITIONAL ANALYSES OF THE SEVEN CITY LEAD STUDY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 14p., March 15, 1973.*

Some of the statistical analyses on air lead levels in selected american communities were redone. The results of the original analysis on the air lead exposure and blood lead levels of over 1900 white women were generally substantiated, with one important difference. The contribution of the air lead gradient and urban-suburban contrast on blood leads were shown to be significant, with each explaining approximately 18% of the total area variation in blood lead concentrations. These two (nonindependent) comparisons explain more than twice as much of the total variation in blood leads as do either smoking or age. (Author summary modified)

32776 **APTIC NO. 54188**

Hattori, M.

ALTERATION OF BRONCHO-ALVEOLAR SYSTEM BY POLLUTED AIR: EXPERIMENTAL CONSIDERATION. *(Osen taiki ni yoru kikanshi haihokei no henka: jikkenteki kosatsu). Text in Japanese. Clinician, no. 219:4-8, June 1973.*

Mice were exposed to 0.2-0.5 ppm nitrogen dioxide and 50 ppm of carbon monoxide which caused pathological alteration of the broncho-alveolar system. The cilia swelled and the clara cells collapsed on the bronchial epithelium of the lung of mice exposed for 10 days. Alternation of smaller alveolar epithelial cytoplasm and disturbance of mitochondrial crista of several larger epithelial cells were found. Hyperplastic foci appeared on the bronchiolar epithelial cells of mice exposed continuously for 30 days to 0.5-0.8 ppm NO2; this alteration disappeared slowly after stopping exposure. In another experiment, mice were exposed to outside air while other mice were raised in pure air. In the first group, ablation and proliferation of epithelial cells were found in mice exposed for 3 mo; after 12 mo, all mice had interstital pneumonia, while no alteration was noticed in the second group. An electron microscope showed proliferation of bronchiolar epithelium, especially Clara cells after 3 mo of exposure to outdoor air; shortening or disappearance of cilia also occurred after 6 mo exposure. After 12 mo, the profileration became more conspicuous. The accumulation of coal powder on alveolar walls, collagenation of elastic fibers, and thickening of interstitial matter of the alveoli were noted. These alterations can cause respiratory system changes and can reduce bacterial infection resistance and hyperphastic foci-formation.

32777 **APTIC NO. 55274**

Hirose, H.

THE THREE BRONCHIAL DISEASES OF THE HEALTH INSUREDS OF A FACTORY AND THEIR DEPENDENTS, PART I. FREQUENCY OF EXAMINATION AND OF OCCURRENCE OF NEW PATIENTS. *(Bokojo kenpo hihokensha oyobi hifuyosha ni tsuite mita kikanshi san shikkan no doko(dai ipo) jushinritsu oyobi shinkan hasseiritsu). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10):518, Oct. 1973. (Presented at the Japan Society of Public Health, Annual Meeting, 32nd, Oct. 1973.)*

In order to obtain the trend of air pollution of the Tokushima area using the health insureds of the Tokushima Factory of Nisshin Spinning Co. and their dependents as a sample of the city inhabitants, the number of patients suffering from chronic bronchitis, asthma, and pulmonary emphysema during 15 years from the opening of the factory was enumerated from the health insurance receipts. The factory is located to the north of the city in a collective industrially developing area. The insureds and their dependents were classified by the distances from the factory. The wind is prominently westerly in the winter and easterly in the summer. The frequencies of examination and the occurrence of new patients correlated with the distance from the residence to the factory showed no such marked differences.

32778 **APTIC NO. 54384**

Imamura, Toshiko and Masayuki Ikeda

LOWER FIDUCIAL LIMIT OF URINARY METABOLITE LEVEL AS AN INDEX OF EXCESSIVE EXPOSURE TO INDUSTRIAL CHEMICALS. *Brit. J. Ind. Med. (London), 30(3):289-292, July 1973. 21 refs.*

The use of the lower fiducial limit, as opposed to the mean, as an index of excessive exposure to industrial chemicals is discussed. Previously reported data on the quantitive relationship between the levels of three industrial agents (phenol, trichloroethylene, toluene) in the air of workrooms and the concentration of the corresponding metabolites in the urine of exposed workers were studied. Comparison of these data indicates that the reliability of the screening level depends on the ratio between the normal value and atmospheric threshold limit value (TLV), as well as on the ranges of variation of the two values. When the screening level is set at the mean of the metabolite concentration corresponding to the TLV, the actual exposure of about half of the workers will be underestimated; the use of the lower fiducial limit as the screening level will result in under estimation of the exposure intensity at 5%.

32779 **APTIC NO. 54177**

Ishihara, N.

PROBLEMS ABOUT THE TOLERANCES FOR NICKEL. *(Nikkeru no kyoyo nodo o meguru mondaiten). Text in Japanese. Igaku no Ayumi (Progr. Med.), 85(9):537-538, June 1973. 4 refs.*

The Japan air quality standard for nickel is 1 mg/cu m of air; however the basis for establishing this standard is questionable because of the lack of information whether there really is no harm from atmospheres with lower nickel concentration and whether there really is no harm from lower nickel concentrations co-existing with other pollutants. Rats exposed to 1/10 of the standard concentration suffered changes in the lung. After inhaling 120 micrograms/cu m of nickel oxide for 2 wk, rats had macrophages accumulating in the lung, infiltration of lymphocytes into the alveolar wall, and other pathological changes. Longer exposure resulted in thickening of the alveolar wall. Inhalation of 109 micrograms/cu m of nickel dichloride for 2 wk produced pathological changes. The maximum nickel concentration found in cities in the U. S. is 0.12 micrograms/cu m; however, considering the experimental carcinogenity of nickel, the standard of 1 mg/cu m nickel is too high. Genuine tolerance and threshold levels must be determined.

32780 **APTIC NO. 54488**

Jacques, Andre and Hanspeter R. Witschi

BERYLLIUM EFFECTS ON ARYL HYDROCARBON HYDROXYLASE IN RAT LUNG. *Arch. Environ. Health, 27(4):243-247, Oct. 1973. 22 refs.*

Beryllium was studied to determine its effect on pulmonary mixed function oxidases. Rats were injected intratracheally with 150 micron mols/kg of a neutralized solution of beryllium sulfate ($BeSO_4$). The activity of pulmonary aryl hydrocarbon hydroxylase (AHH) was measured on the first, second, and seventh day, and then two and four weeks after beryllium injection. The specific activity of AHH seemed to be lowered by beryllium; but if the data were calculated as total AHH activity per lung, changes were much smaller and detectable only within the first 2 days after beryllium exposure. Beryllium did not prevent the induction of pulmonary AHH by methycholanthrene. Synthesis of RNA in rat lungs exposed to beryllium was higher than in controls, probably because of the acute chemical pneumonoitis produced by beryllium. Beryllium could not presumably act as a pulmonary cocarcinogen by interfering with the metabolism of carcinogenic polycyclic hydrocarbons in the lung. (Author abstract modified)

32781 **APTIC NO. 54963**

Juchau, M. R.

PLACENTAL METABOLISM IN RELATION TO TOXICOLOGY. *Crit. Rev. Toxicol., 2(2):125-158, Sept. 1973. 163 refs.*

Pollutants affecting placental biochemistry are described in a review of placental metabolism in relationship to toxicology. It is significant that at least one placental system of xenobiotic biotransformation, aryl hydrocarbon hydroxylase (AHH, also referred to as benzyprene hydroxylase since the substrate normally employed is 3,4-benzyprene) appears to be more active at term than during the first two trimesters of human pregnancy. Such observations would tend to implicate the placental syncitium as the principal cellular site for this important enzyme system which catalyzes the mixed function oxidation of numerous polycyclic hydrocarbons to which human populations are very frequently exposed. Such hydrocarbons are present in automobile exhausts, factory smoke, cigarette smoke, and frequently are potent carcinogens.

32782 **APTIC NO. 54173**

Kabayama, Hisao

CLINICAL USE OF LYSOZYME EYE DROPS ON KERATOCONJUNCTIVITIS DUE TO PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku sumoggu ni yoru hyoso kaku ketsumakuen ni taisuru rizochimu tenganyaku no shiyo keiken). Text in Japanese. Rinsho Ganka (Clin. Opthalmol.), 27(7):905-910, July 1973. 10 refs.*

Lysozyme eye drops were administered to 30 patients with chemical conjunctivitis or superficial keratitus caused by photochemical smog. Six patients showed excellent improvement, 15 showed fair improvement, and nine showed no improvement. The improvement rate was therefore 70%. The healing period in cases of moderate or severe keratitus averaged 5.2 days, and for moderate conjunctivitis, 3.2 days. The healing period is shortened in comparison to the conventional topical steroid therapy. Side effects included a slight smarting in the eyes of more than half the patients, and swelling, hyperemia, and itching of the conjunctiva in one specific allergic patient. This particular side effect disappeared on discontinuation of therapy. (Author abstract modified)

32783 **APTIC NO. 54479**

Khachaturyan, M. Kh. and V. M. Styazhkin

INTERACTION OF CONDITIONED AND UNCONDITIONED STIMULI IN THE PRESENCE OF A COMBINATION OF LOW CONCENTRATIONS OF BUTYRIC ACID AND RHYTHMIC LIGHT IN MAN. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 111-116, APTD-1366. 12 refs. Translated from Russian. (Also: Ucheyne Zapiski, 1968:34-41, 1968.)*

NTIS: PB 214264

Interaction between conditioned and unconditioned stimuli was studied for purposes of sanitary standardization. An unconditioned stimuli, rhythmic light at frequencies causing an optimally expressed unconditioned reflex rearrangement of rhythms in the electroencephalograph of man (8-10 Hz), was paired with a conditioned reflex to the odor of butyric acid in concentrations of 0.06, 0.03, and 0.015 mg/cu m. The presence of an analyzer and integrator made it possible to quantitatively characterize the shifts caused by the two stimuli, not only on the basis of the total bioelectric activity, but also directly from the reaction to the rhythmic stimulus. Many studies of ten pairings each were performed on four persons. The largest shifts took place at the highest intensity, 0.06 mg/cu m of butyric acid, and the reverse was also true. These shifts were most distinct for the alpha rhythm range in the leads which are reached by impulses from olfactory stimulation. The high sensitivity of the method makes it possible to recommend it for sanitary standardization work.

32784 **APTIC NO. 54925**

Kilroe-Smith, T. A., Ian Webster, M. Van Drimmelen, and L. Marasas

AN INSOLUBLE FIBROGENIC FACTOR IN MACROPHAGES FROM GUINEA PIGS EXPOSED TO SILICA. *Environ. Res., vol. 6:298-305, 1973. 7 refs.*

A fibrogenic factor was demonstrated in alveolar macrophages of guinea pigs exposed to a quartz dust cloud or following the intratracheal injection of quartz. This factor produced granulomata when implanted subcutaneously into guinea pigs. It was also very stable to such acids as a mixture of acetic and trichloroacetic acids at pH 4. The factor was associated with the insoluble debris produced after sonic disintegration of the macrophages but the fibrogenicity could not be attributed to the unreacted silica associated with this debris. Extraction of the lipids with chloroform:methanol (2:1) did not impair the fibrogenic properties of the macrophage residue. (Author abstract)

32785 APTIC NO. 54395

Kuntz, Erwin

PATHOPHYSIOLOGY OF CHRONIC BRONCHITIS. *(Pathophysiologie der chronischen Bronchitis). Text in German. Muench. Med. Wochschr. (Munich), 115(34):1422-1428, 1973.*

The pathophysiology of chronic bronchitis is summarized. The bronchial mucous membrane responds to a complex of causative factors with a bronchial mucociliary failure (hypercrinia, dyscrinia, metaplasia, mucostasis), which is the cause of coughing and expectoration. Bronchial obstruction follows and appears in the form of volume dependent obstruction (bronchial spasm, edema of the mucous membrane, secretory mucostasis) and pressure dependent obstruction (relaxation of the bronchial wall and supporting tissue of the lungs). This causes breathlessness. Pathophysiologically, breathlessness arises from disorders of the mechanics of respiration, of exchange of gases and of pulmonary dynamics. This is the origin of functional disorders such as obstructive or restrictive disturbances of ventilation, disorders of ventilation distribution, of diffusion, perfusion, alveolar hypoventilation, as a result of which the final stages of respiratory failure and chronic cor pulmonale develop. (Author abstract modified)

32786 APTIC NO. 54943

Kysela, B., D. Jirakova, R. Holusa, and V. Skoda

THE INFLUENCE OF THE SIZE OF QUARTZ DUST PARTICLES ON THE REACTION OF LUNG TISSUE. *Ann. Occupational Hyg., vol. 16:103-109, 1973. 11 refs.*

The effect of intratracheal administration of equal masses (50 mg) of nine samples of quartz dust of varying particle size from 0.7 to 35 micron was investigated in rats. After 3 mo the wet weights of lung, hydroxyproline, total lipids, esterified fatty acids, total cholesterol, and phospholipids were determined, and histological examinations were made. The statistically evaluated results confirmed the high potency of dust particles smaller than 5 micron, but showed also differences between individual samples above and below this level. The most sensitive indicators of the responses of lung tissue are the values of total lipids and phospholipids. In agreement with the histological picture, the highest fibroplastic effect, i.e., the highest hydroxyproline value, was found in dust with particles smaller than 1 micron, although the lipid values were smaller than in dust with particles of 3-5 micron. A more detailed analysis of lung lipids is recommended. (Author abstract modified)

32787 APTIC NO. 54489

Lebowitz, Michael D. and Benjamin Burrows

AIR POLLUTION AND RESPIRATORY ILLNESS. *Arizona Med., 30(8): 543-547, Aug. 1973. 38 refs.*

Investigations into the relationship between air pollution and respiratory illness are reviewed. These investigations are of two major types: controlled laboratory experiments and epidemiological studies. While past laboratory studies concentrated on relating gross physiological changes to air pollution exposure, current studies are focusing on the effects of pollution on lung defense mechanisms. The laboratory data has indicated that: pollutants normally found in urban air can adversely affect body functions essential to respiratory health; the effects of the pollutants may be subtle, delayed, and nonspecific; there may not be a true threshold for air pollution health effects; and the adverse effects of air pollution are probably not ascribable to any single contaminant. The epidemiological studies have dealt with the effects of both photooxidant and reducing type smogs in urban environments. These investigations have limitations due to necessarily stringent requirements with regard to experimental design and analytic methodology. Epidemiological investigations have indicated that: during periods of excessive reducing type pollution associated with climatic inversions, there is a sharp rise in deaths due to respiratory illness; pollutants predispose to or precipitate acute respiratory illness; higher incidences of respiratory infections occur in areas where air contamination is high; and respiratory impairments associated with chronic bronchitis and emphysema are more prevalent in areas high in reducing type air pollution. Questions regarding such problems as the importance of specific air contaminants in producing adverse health effects remain to be answered. Additional laboratory and epidemiological studies are needed to elucidate the basic mechanisms of air pollution effects, to clarify the interactions among pollutants, to quantify the health effects of pollutants, to study specific types of pollutants other than urban smog, and to determine the possible extent of air pollution effects.

32788 APTIC NO. 54965

Lebowitz, Michael D., Toshio Toyama, and James McCarroll

THE RELATIONSHIP BETWEEN AIR POLLUTION AND WEATHER AS STIMULI AND DAILY MORTALITY AS RESPONSES IN TOKYO, JAPAN, WITH COMPARISONS WITH OTHER CITIES. *Environ. Res., vol. 6:327-333, 1973. 7 refs.*

Stimulus-response analysis of three years of Tokyo daily mortality in relationship to air pollution and weather yielded significant relationships between abnormal environmental events and subsequent high mortality events. Correlations of the raw data variables revealed high correlations between daily deaths and temperature (about minus 0.5 for the total period and for winters; minus 0.2 for summers) and lower correlations between deaths and the pollutants sulfur dioxide and suspended particulate matter (below 0.3 for the total period in winters; below 0.2 for summers). All correlations decreased when the effect of season and day of the week were removed by the use of standard scores. The multiple correlation coefficient for all seasons was 0.36, with temperature contributing the most (regression coefficient of minus 0.26), followed by sulfur dioxide (coefficient of 0.18). The winter multiple correlation was much higher, 0.51, while the summer figure was only 0.28. The environmental index and the Green index when correlated with daily mortality yielded much lower correlation coefficients and regression coefficients indicating that much better results are obtained when allowing the sulfur dioxide and suspended particulate matter to interact with temperature to seek their own weights in the regression as a control of interactions and interdependence. Comparison of the statistics with those of a New York City study showed similar relationships between the magnitudes of the events and their nature, though relative contributions of the environmental variables in the winter were different and regressions for Tokyo in the summers appeared somewhat stronger.

32789 APTIC NO. 55260

Macdonald, Eleanor J., Harris Lichtenstein, Daryl Nooner, Donald Flory, Sten Wikstrom, and J. Oro

EPIDEMIOLOGICAL FACTORS IN LUNG CANCER AMONG WOMEN IN EL PASO COUNTY, TEXAS, 1944-1969. *J. Amer. Women Assoc., 28(9):459-464, 466-467, Sept. 1973. 13 refs.*

Information from 1 million Negroes, 1 million Latins, and 2 million other than Latin Caucasians was tabulated. Cancer of the cervix and cancer of the lung were nearly double in incidence among Latin women as compared to other than Latin women in the same community. A multitude of possible etiological factors were studied and the most important of which appeared to be residence from birth to adult life in an adobe house. These houses are solidly built structures, nearly airtight, and usually poorly ventilated. Heating is usually in the center of the main room, and the oil, wood, coal, or other fuel burned causes sooty discoloration on the walls and ceilings. Scrapings from the walls and ceilings were analyzed and polynuclear aromatic hydrocarbons and DDT were found. Radioactivity was present but not in significant amounts. Other variables included lifetime exposures to dust storms, copper smelter smoke, heating materials, occupational exposure, disease history, economic status, and smoking history by type, amount, and duration.

32790 **APTIC NO. 55303**

Maillard, J. -M.

NONCONIOTIQUE PROFESSIONAL PULMONARY PATHOLOGY. *(La pathologie pulmonaire professionnelle non coniotique). Text in French. Schweiz. Med. Wochenschr., 103(30):1073-1074, July 1973. 17 refs.*

Occupational diseases of the lung are due not only to the inhalation of dusts (the pneumoconioses) but also the action of various nonconiotic industrial pollutants (vapors, gases, fog, and smoke). The diagnostic problems are sometimes difficult and therefore require cooperation between the physician and the occupational hygienist. The nonconiotic disorders include occupational asthma, extrinsic allergic alveolitis, and possibly chronic bronchitis. These and other nonconiotic occupational diseases of the lung are likely to assume increasing importance in the future. (Author abstract modified)

32791 **APTIC NO. 54320**

Martin, A. E.

ENVIRONMENT AND THE PUBLIC HEALTH. *Roy. Soc. Arts J., 121(5205):599-609, Aug. 1973.*

Pollutants that affect the atmosphere and public health are discussed. The most important public health hazard in developing countries is water pollution by pathogenic organisms. Water pollution in developed countries has generally been solved by the use of chlorine, although increased attention is being paid to chemical contamination of water supplies. The main problems come from nitrates, phosphates, carbon compounds, pesticides, trace elements, and water hardness. Nitrates can reduce the oxygen carrying power of the blood and primarily affect infants. Nitrates may also form nitrosamines which might be carcinogenic. The possible relationship of hard and soft waters to cardiovascular disease is puzzling and being investigated. The chronic effects of air pollution are difficult to demonstrate and may be due to combined actions of a number of pollutants including the oxides of sulfur. While air pollution may have an effect on cancer of the lung, it is negligible in comparison to smoking. Other than the toxic effects of carbon monoxide, it may also inactivate as much as 3% of the hemoglobin. Other exhaust fumes can undergo photochemical reactions which cause smog. Metals as lead, cadmium, and mercury are receiving increased attention. The metals are ubiquitous, and the total intake in the body must be considered in determining their hazardous effects.

32792 **APTIC NO. 54977**

Merchant, James A., John C. Lumsden, Kaye H. Kilburn, Victor H. Germino, John D. Hamilton, William S. Lynn, H. Byrd, and D. Baucom

PREPROCESSING COTTON TO PREVENT BYSSINOSIS. *Brit. J. Ind. Med. (London), 30(3):237-247, July 1973. 29 refs.*

Sixteen subjects who had shown reductions in expiratory flow rate with exposure to cotton dust participated in a study to determine the efficacy of preprocessing cotton to prevent byssinosis. The subjects were exposed to raw cottons and cottons which had been proprocessed by heating, washing, and steaming. Exposure to the panel to no cotton dust resulted in no change in FEV1.0. Exposure to strict middling cotton resulted in a byssinosis symptom prevalence of 22%, a significant 2.9% decrement in FEV1.0, and a fine dust level of 0.26 mg/cu m. Exposure to strict low middling cotton resulted in a byssinosis symptom prevalence of 79%, an 8.5% decrement in FEV1.0, and a fine dust level of 0.89 mg/cu m. Oven heating strict low middling cotton resulted in a byssinosis symptom prevalence of 56% and a drop of 8.3% in FEV1.0 for 0.48 mg/cu m of fine dust. Washing the strict low grade cotton eliminated detectable biological effects, with a symptom prevalence of 8%, an increase of 1.4% in FEV1.0, and a dust level of 0.16 mg/cu m, but the cotton proved to be difficult to process. As an alternative method, strict low middling cotton was steamed initially in large dyeing vats, on a conveyor, in an autoclave, and in a modified yarn dyeing apparatus or pipe steamer. Of these methods, autoclaving was the most successful, reducing the symptom prevalence to 8%, an 0.4% drop in FEV1.0, and a dust level of 0.23 mg/cu m. The development of a high capacity cotton steamer based on the small pipe steaming model resulted in a symptom prevalence of 8%, an 0.8% decrement in FEV1.0, and a mean dust level of 0.27 mg/cu m. Regressions calculated from raw and high capacity steaming trials indicate that at low dust levels, steamed cotton dust was roughly one half as biologically active as raw cotton dust.

32793 **APTIC NO. 54193**

Mikami, R.

INFLUENCE OF PHOTOCHEMICAL SMOG ON THE HUMAN BODY: FROM THE EXAMINATION OF THE DAMAGE CASES IN JAPAN. *(Kokagaku Sumoggu jintai niwa dono yona eikyo o motarasukawagakuni ni okeru higairei no kento kara). Text in Japanese. Clinician, no. 219:14-18, June 1973.*

There are some differences between the symptoms of smog in Los Angeles and Japan, especially in the suburbs. Three major photochemical smog episodes occurred in Japan, two in Tokyo and one in Osaka. They caused common symptoms, especially in cases which necessitated hospitalization. These symptoms included headache, eyeache, lachrymation, throat irritation, coughing, dizziness, nausea, chill, fatigue, numbness of extremities, spasms, facial reddening, and dyspnea. Increased leukocyte count, increased neutrocytes, and decreased lymphocytes also occurred.

32794 **APTIC NO. 54476**

Minayev, A. A.

EFFECT OF LOW CONCENTRATIONS OF ALPHA-METHYLSTYRENE VAPOR ON THE HUMAN ORGANISM. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 90-97, APTD-1366. 8 refs. Translated from Russian. (Also: Uchenye Zapiski, 1968:42-49, 1968.)*

NTIS: PB 214264

Atmospheric pollution was studied around a new plant producing divinyl-methylstyrene synthetic rubber from associated gases of petroleum production and refining as the raw materials. Air samples were taken 1.5 m above the ground at the plant site and at eight zones at distances from 500 to 5000 m on the leeward side of the plant. The most extensively dispersed toxic agent was alpha-methylstyrene, which was found up to 4000 m. The influence of low concentrations of alpha-methylstyrene on the human organism was studied first by odor perception. The threshold of odor perception of C6H5C(CH3):CH2 ranged from 0.1 to 0.6 mg/cu m. A study of the influence of low concentrations of C6H5C(CH3):CH2 vapor on the reflex reactions of the organism was then made by the method of dark adaptation of the eye on the subjects having the lowest odor perception threshold. Concentrations of

C6H5C(CH3):CH2 at 0.08 mg/cu m caused no changes in the light sensitivity of the eye. Low concentrations of C6H5C(CH3):CH2 were then studied in relation to the bioelectric activity of the human cerebral cortex. Alpha-methylstyrene in concentrations of 0.10 and 0.06 mg/cu m affected the bioelectric activity of the cerebral cortex, and a concentration of 0.04 mg/cu m was inactive for all subjects. Therefore, the concentration of 0.04 mg/cu m did not cause any subjective sensations or reflex reactions in the human organism and can be recommended as the highest single maximum permissible concentration of C6H5C(CH3):CH2 vapor for atmospheric air in populated areas.

32795 **APTIC NO. 54568**

Mitchell, Donald A. and Emil K. Schandl

CARBON MONOXIDE, VITAMIN B6, AND MULTIPLE SCLEROSIS: A THEORY OF INTERRELATIONSHIP. *Amer. J. Clin. Nutr., 26(8):890-896, Aug. 1973. 51 refs.*

A theory of interrelationship is proposed for carbon monoxide presence, vitamin B6 (pyridoxine), and multiple sclerosis. Results of experiments linking CO exposure to myelin degeneration are theorized to be at least partially due to the pyridoxine deficiency produced by CO in addition to direct CO poisoning. Similarities have interestingly been shown between the impaired immune response to multiple sclerosis patients and impaired antibody formation of pyridoxine-deficient individuals. Moreover, chronic exposure to CO in man has been shown to result in increased gamma globulin levels in the serum and brain proteins, while elevated levels of gamma globulin in the cerebrospinal fluid of multiple sclerosis patinets has also been demonstrated. The curious remissions of multiple sclerosis are hypothesized to be periods either when the attaching force, CO, is gradually removed from the system, reducing pyridoxine requirements to a satisfactory level or when the patient is maintained on a diet that incidentally contains quantities of pyridoxine sufficient for him to perform all pyridoxine-related functions. High incidence of multiple sclerosis has been shown to accompany high automotive populations except where protective factors such as high dietary consumption of vitamin B6-rich foods prevail. It is suggested that the demyelination associated with multiple sclerosis may be prevented if sufficient quantities of pyridoxine are consumed or contact with CO is minimal, or both.

32796 **APTIC NO. 54194**

Mizutani, N.

STUDIES ON THE PROGNOSES OF PATIENTS SUFFERING FROM CHRONIC OBSTRUCTIVE LUNG DISEASES. *(Yokkaichi chiku mansei heisokusei hai shikkan kanja no yogo ni kansuru kenkyu). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(8):492, Aug. 1973. (Presented at the Japan Society of Thoracic Diseases, Tokai Branch, 22nd, 1973.)*

Since a system for compensating persons suffering from pollution- related diseases was established in 1965, 1195 patients in Yokkaichi have been classified as suffering from pollution-related diseases, primarily bronchial asthma, chronic bronchitis, and asthmatic bronchitis. Forty percent of the patients were less than 9 years old, 36% were older than 50 years old. Sixty-six persons died. Of 15 cancer deaths, six were due to lung cancer. Patients with chronic respiratory diseases had three times the spirometry of persons from unpolluted zones. Hemoglobin decreased in polluted areas, and body weight and electrocardiograms showed no difference with bronchial asthma and pulmonary emphysema. X-rays showed inflammations in emphysema cases. For vital capacity and forced expiratory volume, no differences occurred in bronchial asthma cases in both zones, and emphysema cases had a decrease of 69.4 ml/yr in polluted zones and 3.1 ml/yr in unpolluted zones.

32797 **APTIC NO. 54530**

Moriwaki, Toshio

STUDIES ON NONRESPIRATORY FUNCTION OF THE LUNG--WITH SPECIAL REFERENCE TO THE INFLUENCE OF OZONE EXPOSURE ON NA+-K+, ATPASE AND LIPID METABOLISM IN LUNG TISSUE. *(Hikokyusei hai kino ni kansuru kenkyu--toku no O3 no hai soshiki Na+-K+, ATPase oyobi shishitsu ni oyobosu eikyo ni tsuite). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(7): 406-416, July 1973. 30 refs.*

The effects of 10 to 20 ppm ozone on sodium-potassium ATPase activity, and lipid metabolism within the lung were investigated. In the ozone exposed lung, the ATPase activity was about 2/3 of that observed in the normal lung, and the incorporation of 14C-palmitate into phospholipids within the lung tissue was inhibited by 2 hr of exposure to 20 ppm ozone. Following exposure, there was a decrease in the phospholipid content of the lung membrane, and an increase in the triglyceride fraction. The phospholipid content, especially that of phosphatidyl choline, was also decreased ithe bronchial washing. Lipid peroxidation, as measured by TBA reaction, was significantly increased, especially in the triglyceride fraction; it was inhibited following the administration of an antioxidant. The fatty acid composition of the phospholipid and triglyceride fractions of the lung tissue and bronchial washings were not affected by exposure to ozone. Thus ozone appears to inhibit phospholipid synthesis and lipid peroxidation within lung tissue.

32798 **APTIC NO. 55277**

Mouri, Takaji

EXPERIMENTAL STUDIES ON THE INHALATION OF MANGANESE DUST. *Text in Japanese. Shikoku Igaku Zasshi (Shikoku Acta Medica), 29(3):229-233, June 25, 1973. 24 refs.*

The influence of manganese exposure in mice on the histological changes of some organs was investigated. Using the specially designed dust exposure unit, six adult female mice were given manganese dioxide dust (particle size under 3 micron) daily every 2 hr for 8 days in the concentration of 8.91 mg/cu m as Mn. The histological changes in the lung were observed in all mice with the catarrhal pictures such as shedding of bronchial epithelium and alveolar cells which contained Mn dust, thickening of alveolar walls, bleeding of alveolar lumens and dilation of alveolar capillaries. These findings may suggest that the Mn dust of a small particle size even in a relatively low concentration has some toxic effect to respiratory epithelium with elevated Mn concentration in the lung. The histological changes were not observed in the tissues of liver, kidney, pancreas, and spleen.

32799 **APTIC NO. 54215**

Mustafa, Mohammad G., Anthony J. DeLucia, George K. York, Christopher Arth, and Carroll E. Cross

OZONE INTERACTION WITH RODENT LUNG. II. EFFECTS ON OXYGEN CONSUMPTION OF MITOCHONDRIA. *J. Lab. and Clin. Med., 82(3):357-365, Sept. 1973. 48 refs.*

Mitochondrial oxygen consumption was studied in male rats (60-90 days old) who were exposed to ozone either acutely (2 ppm for 8 hr) or subacutely (0.8 ppm for 10-20 days). For in vitro experiments, suspensions of rat lung homogenates or rat lung mitochondria were exposed to a flow of 10-15 ppm O3/min for 20 min; both homogenate and mitochondrial preparations absorbed O3 at a rate of 2.3 to 5.0 ppm/min. Thirty to 40 nmoles O3/mg of protein was absorbed. Subsequent to acute exposures, the rate of O2 consumption in lung homogenate or mitochondrial fraction decreased approximately 25% for homogenate and 45% for mitochondria. In contrast to the effects of acute O3 exposures, subacute exposures resulted in an augmentation of lung cellular O2 utilization. As high as 45% stimulation of O2 consumption occurred in homogenates of subacutely exposed rat lungs compared to those of control rat lungs. The specific activity in the isolated mitochondrial fraction was only 15% higher in the lungs of exposed rats. There was a threefold greater abundance of large alveolar cells in exposed rat lungs. Lung mitochondrial respiratory activity may serve as a biochemical index for possible changes of cellular constituency in the lung following chronic oxidant exposure. (Author abstract modified)

32800 **APTIC NO. 54201**

Nagumo, Kiyoshi

THE SECRET OF TOKYO-TYPE PHOTOCHEMICAL SMOG, PART 4, CONCERNING THE CAUSAL THEORIES (1). *(Tokyo-gata kokagaku sumoggu no himitsu (4), geninsetsu o megutte (1)). Text in Japanese. Kenko Kaigi (Health Assem.), no. 286:37-44, 1973. 6 refs.*

Symptoms of pupils affected by a photochemical smog episode in Tokyo are discussed. The oxidant concentration was only 0.06 ppm, far less than the warning concentration of 0.3 ppm. Photochemical smog symptoms may have been caused by cyanide derivates. To prove this, the natural mortality of birds near the area was compared with sudden, increased mortality; symptoms due to cyanide derivates such as hydrogen cyanide, chloride cyanide, cyanamide, cyanates, and acrylonitrile were compared to photochemical smog symptoms.

32801 **APTIC NO. 54968**

Obe, Gunter and Renate Slacik-Erben

SUPPRESSIVE ACTIVITY BY FLUORIDE ON THE INDUCTION OF CHROMOSOME ABERRATIONS IN HUMAN CELLS WITH ALKYLATING AGENTS IN VITRO. *Mutat. Res., 19(3):369-371, Sept. 1973. 11 refs.*

Sodium fluoride was investigated in combination with three alkalating agents in human cells in vitro to determine if fluoride inhibits the induction of chromosome breaks. The mutagens used were 2,5-bis-(methoxyethoxy)-3,6-bis-ethyleneimino-p-benzoquinone (A139), 2,3,5-tris-ethyleneimino-p-benzoquinone (trenimon), and 2,3,5,6-tetraethyleneimino-p-benzoquinone (TEB). Sodium fluoride alone had no effect on the chromosomes. The ethyleneimines induced typical chromatid aberrations whose frequencies were lowered in the combination series with NaF. The suppressive effect of fluoride was especially clearcut with the chromatid translocations (RB prime). Considerable amounts of triradials were only seen with TEB. This aberration type was also lessened in the combination series, showing a frequency of 0.04 per cell with TEB alone and 0.01 with TEB and NaF. The frequencies of achromatic lesions were lowered or not changed at all in the combination series. Fluoride had a strong antimutagenic effect on the aberration induction with polyfunctional alkylating agents.

32802 **APTIC NO. 54897**

Paiva, Manuel

GAS TRANSPORT IN THE HUMAN LUNG. *J. Appl. Phys., 35(3):401-410, Sept. 1973. 32 refs.*

The transport equation of gases in the bronchial tree of the human lung was solved numerically. The model was built from the anatomical data of Weibel. The formulation of the problem takes into account the influence of the alveolar septa upon the diffusion rate. The solution of the transport equation can be verified experimentally by analysis of the nitrogen washout and particularly by the single breath test. The solution of the transport equation was analyzed as a function of shape of the flow, tidal volume, and period of the respiratory movements. The incidence of the ventilation distribution in these curves was shown. During inspiration, the convection movement favors the stratification which exists in the very last generations and favors its elimination during expiration, the stratification being then entirely negligible at the end of the expiration. The final part of the classical single breath test (alveolar plateau) is due essentially to phenomena other than the gas transport by diffusion and convection in the series spaces. (Author abstract modified)

32803 **APTIC NO. 55279**

Pimentel, J. Cortez and Ramiro Avila

RESPIRATORY DISEASE IN CORK WORKERS (SUBEROSIS). *Thorax, 28(4):409-423, July 1973. 22 refs.*

A clinical, immunological, and histological study of 63 workers in the cork industry with bronchopulmonary manifestations is described. Three types of reaction to the inhalation of cork dust were recognized: asthma-like syndromes, extrinsic allergic alveolitis, and chronic bronchitis with bronchiectasis. The place of histological (lung biopsy and scalene node biopsy) and immunological methods in the diagnosis of these different forms of the disease is evaluated. The high incidence of precipitins to Penicillium frequentans is stressed because the antigens produced by this fungus seem to be more pathogenic than those produced by the moldy cork itself. The histological studies have demonstrated extrapulmonary foci of disease and have also revealed for the first time, abnormalities in the lungs of symptomless subjects. Pathological changes present in the lungs of patients with the chronic form of extrinsic allergic alveolitis, long after removal from exposure to cork dust, are also described. The experimental material of Horta and Cancella is reviewed in the light of present knowledge, and the similiarity between the lesions produced in animals and those found in cork workers is noted. Especial importance is attached to the finding of cork dust within the lesions, the technique for its identification and staining is described. (Author abstract modified)

32804 **APTIC NO. 54962**

Plogger, C. G., D. L. Dungworth, and W. S. Tyler

MORPHOMETRIC EVALUATION OF PULMONARY LESIONS IN RATS EXPOSED TO OZONE. *Am. J. Pathol., 71(3):395-408, June 1973. 22 refs.*

Exposure to 3 ppm ozone for 4 hr produced morphometrically quantifiable alterations in the lungs of Sprague-Dawley rats. Lungs of exposed rats were fixed immediately after exposure or after a 12 hr recovery period, and the tissue was evaluated by light and electron microscopy. Immediately after exposure, the volume fraction of nonparenchymal tissue was larger (0.057) than for controls (0.045); that of the lumina of large vessels decreased (0.039) from the control value (0.059). The nonparenchymal tissue fraction was 0.053 12 hr later, while the luminal fraction (0.054) resembled the control value. The volume fractions of parenchyma, total tissue, and air space showed only slight changes. Ozone also affected all three components of the air-blood barrier (epithelial cells, endothelial cells, and interstitium), primarily by the production of intracellular edema. The arithmetic mean thickness of the pulmonary blood-air barrier increased from 1.385 micron in unexposed rats to 1.700 micron in rats immediately after exposure. The primary increase was in thickness of membranous epithelial and capillary endoethelial cells. Partial recovery of total barrier thickness (1.582 micron) occurred 12 hr postexposure. Primary histological findings following acute exposure are pulmonary edema and bronchiolar epithelial degeneration.

32805 **APTIC NO. 55283**

Plopper, C. G., D. L. Dungworth, and W. S. Tyler

ULTRASTRUCTURE OF PULMONARY ALVEOLAR MACROPHAGES IN SITU IN LUNGS FROM RATS EXPOSED TO OZONE. *Am. Rev. Respirat. Disease, 108(3):632-638, Sept. 1973. 20 refs.*

The effect of ozone exposure on the morphology of the pulmonary alveolar macrophage in lung tissue was investigated. Previous studies on O3 effects were conducted on cells obtained by bronchoalveolar lavage. The ultrastructure of pulmonary alveolar macrophages was examined in situ in lung tissue of adult Sprague-Dawley rats exposed to 3 ppm of O3 for 4 hr. Macrophages in the lungs immediately after exposure resembled those in lungs of unexposed animals. The macrophages had active psuedopodia and intact cellular organelles. There types of membrane-bound cytoplasmic inclusions and one unbound type were present. Twelve hours after exposure to O3, the number of observed macrophages had doubled. In addition to a normal macrophage population, there were approximately equal numbers of macrophages containing large granular cytoplasmic inclusions that were regarded as being the result of extensive phagocytic activity. This regimen of O3 exposure did not produce ultrastructurally detectable damage to pulmonary alveolar macrophages in situ with alveoli. (Author abstract modified)

32806 **APTIC NO. 54941**

Prpic-Majic, Danica, P. K. Mueller, V. C. Lew, and Suzanne Twiss

DELTA-AMINOLEVULINIC ACID DEHYDRATASE (ALAD) STABILITY IN HUMAN BLOOD. *Am. Ind. Hyg. Assoc. J., 34(7):315-319, July 1973. 13 refs.*

The stability of delta-aminolevulinic acid dehydratase (ALAD) in human blood was determined and appears to be a useful test for diagnosing the effect of exposure to inorganic lead compounds. When applying this test in epidemiological studies, allowable boundaries concerning the time interval and storage temperature between collection of the blood and the actual enzyme assay become important design criteria. The ALAD test should be started within 2 hr after blood collection. When circumstances prevent this, samples should be kept preferably at 1 C, but never at more than 25 C, and the initial value should be calculated from a statistically estimated decay function. Storage time of more than 24 hr and storage temperatures in excess of 25 C would invalidate any test result. If the hematocrit test could be replaced by a hemoglobin determination, specimens could be stored frozen and thereby greatly facilitate population surveys. (Author abstract modified)

32807 **APTIC NO. 54372**

Ramsey, James M.

EFFECTS OF SINGLE EXPOSURES OF CARBON MONOXIDE ON SENSORY AND PSYCHOMOTOR RESPONSE. *Am. Ind. Hyg. Assoc. J., 34(5):212-216, May 1973. 14 refs.*

The effects of single exposures of carbon monoxide on sensory and psychomotor response were investigated in 20 healthy male subjects aged 19-21 years. The subjects were exposed to a single exposure of 650 ppm CO for 45 min which increased their mean carboxyhemoglobin (COHb) by 7.61%. Another 20 subjects were exposed to 950 ppm CO for 45 min which increased their COHb by 11.22%. Before and after exposures all subjects were given tests for depth perception, visual discrimination for brightness, reaction time to a visual stimulus, and flicker fusion discrimination. The only test showing significant mean decrement after exposure was the reaction time test (P equals 0.005 for one exposed group; P equals 0.006 for the other). The decrement produced by each group was essentially the same (F equals 0.08). (Author abstract modified)

32808 **APTIC NO. 54969**

Reid, D. D.

SMOKE AND SMOKING IN BRITISH BRONCHITIS. *Triangle, 12(1):21-24, 1973. 20 refs.*

Epidemiological studies on the relationship between air pollution and chronic lung disease in Britain are reviewed. Smoke was mainly responsible for the serious aggravation of the disease in the 1962 episode in London, when sulfur dioxide reached the same levels as in 1952, but smoke was much lower. Instead of 4000 excess deaths, there were about 700. The long term effects of exposure to air pollution are evidenced by fewer deaths due to chronic bronchitis in the rural areas of England than in the large industrial cities. There is evidence for the joint action of both air pollution and cigarette smoking. Cigarette smoking may initiate the early stages of chronic bronchitis marked by chronic cough and phlegm production, but the evolution of a more disabling form is hastened by the aggravating effect of exposure to high levels of smoke pollution in the air of British urban areas. The frequency of chronic cough among children is related to the estimated local levels of air pollution by the combustion of coal. The Clean Air Act has been effectively implemented in the London area with manifest benefit to the quality of life in general and the welfare of bronchitic patients in particular.

32809 **APTIC NO. 54383**

Rogan, J. M., M. D. Attfield, M. Jacobsen, S. Rae, D. D. Walker, and W. H. Walton

ROLE OF DUST IN THE WORKING ENVIRONMENT IN DEVELOPMENT OF CHRONIC BRONCHITIS IN BRITISH COAL MINERS. *Brit. J. Ind. Med. (London), 30(3):217-226, July 1973.*

In the course of a long-term prospective study of chronic respiratory disease in British coal miners, the effects on pulmonary ventilatory function of simple pneumoconiosis, chronic bronchitis, and exposure to airborne dust was examined in a group of 3581 coalface workers. The men were employed in 20 collieries throughout the British coalfields. Their cumulative exposures to coal mine dust in the respirable range (1 to 5 micron) were calculated from detailed dust sampling results at their work places over a 10-year period, and from estimates of earlier exposures based on records of their industrial histories. A progressive reduction in FEV1.0 with increasing cumulative exposure to airborne dust was demonstrated. This effect was also evident in a subgroup of men who reported no signs of mild bronchitic symptoms. Among men with pneumoconiosis, there was no evidence of a reduction in FEV1.0 in excess of that attributable to their dust exposures, smoking habits, age, and physique. Increasing severity of bronchitic symptoms was associated with a decrease in FEV1.0 greater than that expected from the effects of dust exposure, smoking, age, and physique. These results may indicate that once early bronchitic symptoms are present, the disease may progress and ventilatory capacity may deteriorate independently of factors initiating the disease process. (Author abstract modified)

32810 **APTIC NO. 54475**

Sakhnovskaya, N. N.

HYGIENIC EVALUATION OF ATMOSPHERIC POLLUTION BY DISCHARGES OF A SULFUR-PRODUCING CHEMICAL-MINING COMPLEX. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 81-84, APTD-1366. Translated from Russian. (Also: Faktory vneshney sredy i ikh znachenie dlya zdorovya naseleniya. Kiev, L. vovskiy Nauchno-Issledovatelskiy Institut Epidemiologii i Mikrobiologii, 1969, p. 55-59.)*

NTIS: PB 214264

The effect of emissions from sulfur-producing, chemical-mining complex were studied to determine their effects on the nearby residential areas. A distinct zonality of the propagation of air pollutants was observed. As the distance from the combine increased, the hydrogen sulfide content decreased. Maximum single and average concentrations exceeded the permissible levels at 1000 m. In the atmospheric air of the residential zone at 2000 m, the average H2S content was 4.6 times the maximum permissible concentration (MPC), and the maximum single values reached 0.209-0.290 mg/cu m at high wind velocities. To determine the effects of these concentrations, a questionnaire measured the health of the inhabitants of this area. The observed differences in the state of the health of the population of this zone of the complex were attributed to a decrease in the resistance of the body under polluted air conditions. An experimental microtoxicological study of the effect of H_2S and sulfur dioxide in combination show that a concentration of 0.0085 plus or minus 0.00012 and 0.570 plus or minue 0.180 mg/cu m, respectively, had a deleterious effect on the body. This concentration is not permissible from a hygienic point of view.

32811 **APTIC NO. 54781**

Sassa, S., J. L. Granick, S. Granick, A. Kappas, and R. D. Levere

STUDIES IN LEAD POISONING: I. MICROANALYSIS OF ERYTHROCYTE PROTOPORPHYRIN LEVELS BY SPECTROFLUOROMETRY IN THE DETECTION OF CHRONIC LEAD INTOXICATION IN THE SUBCLINICAL RANGE. *Biochem. Med., 8(1):135-148, Aug. 1973. 17 refs.*

The application of a simple, rapid, extremely sensitive new assay method for blood protoporphyrin to the detection of lead poisoning in the subclinical range is discussed. This method is especially useful for the detection of chronic lead intoxication in children because of its precision and the fact that only 2 microliters of blood are required for the analysis. Blood protoporphyrin reflected better the level of bone marrow lead existing 2 to 3 months prior to sampling than the circulating blood lead level. The correlation coefficient between log blood protoporphyrin and blood lead was 0.72. Over 95% of the population with a blood lead level of 0.06 mg/100 ml had a protoporphyrin concentration of greater than or equal to 140 micrograms/100 ml RBC. With a group of children whose blood lead was in equilibrium with bone marrow lead, the correlation coefficient was 0.91. Several micromethods for the detection of lead poisoning are discussed. Using a combination of the new protoporphyrin assay and either the determination of blood lead, the presence of increased erythrocytic osmotic resistance, or the measurement of delta-aminolevulinic acid dehydratase, permits a distinction to be made between acute and chronic lead poisoning and/or iron deficiency anemia. (Author summary)

32812 **APTIC NO. 54469**

Sayfutdinov, M. M.

SANITARY CHARACTERISTICS OF AMMONIA AND VALIDATION OF ITS MAXIMUM PERMISSIBLE CONCENTRATION IN ATMOSPHERIC AIR. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, 1973, p. 58-61, APTD-1366. Translated from Russian. (Also: Uchenye Zapiski, 1968:62-65, 1968.)*

NTIS: PB 214264

Atmospheric air around a ferrous metal plant was studied in order to establish the maximum permissible concentration (MPC) of ammonia. The studies were conducted at 500-7000 m and the highest NH_3 concentrations were observed at 500-1000 m. The effect of low concentrations of NH_3 on the physiological reactions of man were studied by determining the threshold of its action on the sense of smell, light sensitivity, and electric activity of the brain. In order to study the resorptive effect of low NH_3 concentrations, white rats were subjected to round-the-clock chronic exposure for 84 days. The threshold concentration causing no change in the bipotentials of the brain was 0.22 mg/cu m, and this level was adopted as the highest single MPC of NH_3 in the atmospheric air. The minimum active NH_3 concentration in a round-the-clock exposure of white rats was 2 mg/cu m, while a concentration of 0.2 mg/cu m was inactive. The mean daily MPC of NH_3 in atmospheric air is recommended to be on the same level with the highest single MPC, 0.2 mg/cu m.

32813 **APTIC NO. 55301**

Schmidt, Ferdinand

ACTIVE SMOKING AND PASSIVE SMOKING AS DANGEROUS BRONCHIAL TOXICANTS. *(Aktiv-Rauchen und Passiv-Rauchen als schwerwiegende bronchiale Noxe). Text in German. Muench. Med. Wochenschr. (Munich), 115(41):1773-1778, 1973. 2 refs.*

Active smoking can cause bronchitis and lung cancer. Passive smoking is also dangerous. The cigarette smoke to which the passive smoker is exposed is particularly rich in benzo-3,4-pyrene. It contains three times the amount the active smoker inhales. For the other 16 carcinogenic aromatics identified to date in cigarette smoke the situation is a similar one. An investigation of the physical condition of nonsmokers yielded a whole list of consequences from passive smoking such as eye irritation, headache, cough, breathing difficulties, sore throat, nausea, hoarseness, dizziness, and renal difficulties. Protection of passive smokers by law is urgently recommended.

32814 **APTIC NO. 54487**

Servin, A., S. Garcet, Vu Ngoc Huyen, and A. Quevauviller

EXPOSURE OF RATS TO SULFUR DIOXIDE. PART 1: BRONCHOPULMONARY EFFECTS AS A FUNCTION OF TIME. *(Exposition du Rat a l anhydride sulfureux. I. Effets bronchopulmonaires en fonction du temps). Text in French. Compt. Rend. Soc. Biol. (Paris), 167(2):212-218, 1973. 10 refs.*

Morphological, histological, and biochemical changes in the bronchopulmonary tract due to the inhalation of sulfur dioxide in rats exposed to 300 to 400 ppm of SO_2 for 85 to 215 hr were studied. Superficial densification of the lungs after 175 hr, increase of the lung weight by 44% and considerable inflation of the lungs after 215 hr of inhalation of 400 ppm SO_2 were observed. Calciform hyperplasia of the epithelial layer first appeared after 175 hr, and it aggravated further in the course of continued inhalation. Subacute lymphocytic peribronchial inflammation and mucus retention were observed after 215 hr. At the same time, increased rate of protein synthesis was noted. The changes persisted for 3 mo after inhalation of SO_2 was stopped.

32815 **APTIC NO. 54189**

Seto, Kaisuo, Masazumi Kawakami, Michiko Takeshima, Makiko Kon, Kido Sugita, and Masao Shishido

INFLUENCE OF SHORT PERIOD EXPOSURE TO OZONE AND NITROGEN DIOXIDE ON THE FORMATION OF PHOSPHOLIPIDS IN THE LUNGS (OF RABBITS). *(Hai no rin shishitsu no seisei ni taisuru ozon oyobi nisanka chisso no tanjikan bakuro no eikyo). Text in Japanese. Igaku to Seibutsugaku, 87(2):57-60, Aug. 1973. 8 refs.*

The effects of ozone and nitrogen dioxide on the formation of phospholipids in the lung and released to the alveolar surface, acting as a furface-active agent, were studied on rabbits. The rabbits were exposed to 0.15, 0.50, and 1.00 ppm O_3 and NO_2. The incorporation of carbon(14) and carbon(14) acetic acid into lecithin decreased by the exposure to O_3 at 0.5 ppm; 3 hr after exposure it was normal. Exposure to 1.0 ppm O_3 for 1 hr caused the incorporation of C(14) from C(14) acetic acid into sphingomyelin, lecithin, phosphatidyl inositol plus serine, and phosphatidyl ethanolamine to decrease. By the exposure to 1.0 ppm NO_2 the incorporation of C(14) from C(14) acetic acid to lecithin was reduced. The retardation of phospholipids formatin was a little stronger at 2 wk exposure than at 1 wk exposure to O_3 or NO_2.

32816 **APTIC NO. 54373**

Smith, William E.

ASBESTOS, TALC AND NITRITES IN RELATION TO GASTRIC CANCER. *Am. Ind. Hyg. Assoc. J., 34(5):227-228, May 1973. 10 refs.*

The relationship between asbestos, talc, and nitrites and gastric carcinogenesis was investigated in a series of experiments. In 45 hamsters maintained throughout their lives on diets containing 1% of the chrysotile or amosite varieties of asbestos, there were no gastric carcinomas and no tumors in the gastrointestinal tract except for a neoplasm in the mesentery of the colon. After intrapleural injection of 25 mg chroysotile or amosite into hamsters, eight to ten tumors were diagnosed as pleural mesotheliomas. Each of 50 hamsters were given right intrapleural injection of 25 mg of a talc containing an asbestos sample suspended in 0.5 ml saline. The animals were followed for their life spans. No tumors attributable to the treatment were found. Granulomatous lesions were common on pleural surfaces, but these lesions tended to be small and focal in contrast to larger and more fibrotic lesions induced in hamsters by chrysotile or amosite. The negative results of this test for carcinogenicity of a talc-containing asbestos and an earlier test on feeding asbestos to hamsters, do not offer support to the view that asbestos-containing talc contributes to the incidence of gastric cancer in Japan. Studies of gastric cancer in Chile resulted in the hypothesis that high rates for esophageal and gastric cancer may be due to conversion of nitrates to nitrites by soil bacteria with subsequent synthesis of nitrosamine carcinogens in plants used as food or through interaction in the stomach with secondary amines in food.

32817 **APTIC NO. 54668**

Stupfel, Maurice, Monique Magnier, and Francoise Romary

THE DIURNAL RHYTHM OF THE ACTION OF CARBON MONOXIDE ON THE CARBON DIOXIDE EMISSION BY GROUPS OF RATS. *(Rythme circadien de l action de l oxyde de carbone sur l emission du gaz carbonique par le Rat en groupe). Text in French. C.R. Acad. Sci. Paris, Ser. D., 276(6):1009-1012, Feb. 1973. 7 refs.*

The diurnal rhythm in the action of carbon monoxide concentrations ranging from 50 to 650 ppm in the carbon dioxide emission by groups of rats exposed periodically at 12-hour intervals to CO was studied. The volume of the CO_2 exhaled by the groups of rats following exposure to CO was 30 to 40% lower in the dark period than it was in the light period. The time lapse between the start of the CO exposure and the modification in the exhaled CO_2 volume ranged from 60 to 100 min. The CO threshold concentrations determined for the dark and light periods were 0.000050 and 0.000300, respectively. The reduced threshold concentration determined for the dark period is most probably due to the intensified rates of respiration and metabolism during this period.

32818 **APTIC NO. 54478**

Styazhkin, V. M. and M. Kh. Khachaturyan

DATA FOR VALIDATING THE MAXIMUM PERMISSIBLE CONCENTRATION OF BUTYRIC ACID IN ATMOSPHERIC AIR. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., 1973, p. 104-110, APTD-1366. Translated from Russian. (Also: Uchenye Zapiski, 1968:27-33, 1968.)*

NTIS: PB 214264

The influence of butyric acid on the physiological functions of the organism was studied. In order to measure the reflex effect of butyric acid, the odor threshold, the change in the light sensitivity of the eye, and the influence of low concentrations on the electric activity of the cerebral cortex, were examined. The threshold of olfactory perception of butyric acid for the most sensitive subject was 0.06 mg/cu m. The threshold of action on the electrical activity of the brain was 0.03 mg/cu m, and the inactive concentration was 0.015 mg/cu m. The highest single maximum permissible concentration which can be recommended is 0.015 mg/cu m. Butyric acid in concentrations of 0.15 and 0.015 mg/cu m in chronic exposure of white rats caused a decrease in the alkaline reserve of whole blood and an increase in the blood chlorides. A concentration of $CH_3CH_2CH_2COOH$ at 0.0076 mg/cu m in chronic action on white rats did not cause the changes observed at higher concentrations. The mean daily average maximum permissible concentration of $CH_3CH_2CH_2COOH$ which can be recommended is 0.005 mg/cu m.

32819 **APTIC NO. 54195**

Takahashi, T.

RESULT OF MORBID RESEARCH OF OBSTRUCTIVE LUNG DISEASES IN THE AIR POLLUTED ENVIRONMENT IN YOKKAICHI. *(Yokkaichi no taiki osen kankyo-ka ni okeru heisokusei hai shikkan no byotai). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(8):491-492, Aug. 1973. Presented at the Japan Society of Thoracic Diseases, Tokai Branch, 22nd, 1973.*

In the industrially polluted region of Yokkaichi, 70% of the asthma cases, 30% of the chronic bronchitis cases, and a few of the pulmonary emphysema cases are due to air pollution. A special clinic classified 156 patients as 116 bronchial asthma cases, 23 chronic bronchitis cases, and 17 pulmonary emphysema cases, of which 77 were asthma victims from polluted zones. In polluted zones, 19.5% of the patients had allergic histories and 41.0% of the patients from the unpolluted areas had such histories. The positivity of allergic reaction with house dust was 37.9% and 48.1%, respectively, in polluted and unpolluted areas. Instant reaction of introcutaneous reaction of bronchoasthma was 70.7% and 59.3%, respectively, in polluted and unpolluted zones; retarded reaction was 44.4% and 36.4%, respectively. Blood chemistry and lung function were also examined.

3[illegible] **APTIC NO. 54206**

Takizawa, T.

PURSUING THE RELATIONSHIP BETWEEN PHOTOCHEMICAL SMOG AND BRONCHILITIS. *(Saikikanshien tono kankei o otte). Text in Japanese. Clinician, no. 219:19-23, June 1973.*

Photochemical pollutants such as ozone can damage the respiratory system. Ozone can cause denaturation of the bronchoalveolar epithelium at 0.25-1 ppm concentrations and acute pulmonary edema at 3 ppm concentrations. Repeated inhalation of low concentrations of ozone (1 ppm) can cause irreversible chronic disturbances such as hyperplasia, ablation of the epithelium, and fibrozination of the walls. The effects of 0.75 ppm of O_3 for 2 hr on lung pressure depression, decrease of airway resistance, and maximum expiration velocity at 50% vital capacity are discussed. Pathological changes could not be easily detected by clinical examinations, x-rays, or functional examinations. Lung compliance can be used to detect changes.

32821 **APTIC NO. 55293**

Toratani, Y., M. Ohira, and H. Aoyama

INVESTIGATION OF THE MORBIDITY OF SPECIFIED DISEASES BY A MONITORING METHOD IN THE MEDICAL ASSOCIATION OF WAKAYAMA CITY - ON THE INFLUENCE OF AIR POLLUTION ON HUMAN HEALTH. *(Wakayama-shi ishikai ni okeru monita hoshiki ni yoru tokutei shikkan no yushoritsu chosa: taiki osen no kenko ni oyobosu eikyo ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10):524, Oct. 1973. (Presented at the Japan Society of Public Health, Annual Meeting, 32nd, Oct. 1973.)*

Morbidity of chronic bronchitis, asthmatic bronchitis, bronchial asthma, lung cancer, and other suspicious cases was studied in residents of an area near an air pollution monitor from July 1971 to March 1972. Age, residence, occupation, and smoking history were reported. The morbidity rate per population of 100,000 was 186.88, 1267.28, 629.26, 24.46, 3.65, and 3.65, respectively, for the diseases. The city was divided into sections with sulfur dioxide concentrations of 1.3 or over, 1.3-1.0, 0.8-1.0, 0.5-0.8, and less than 0.5 mg/100 sq cm/day. The morbidity of diseases was significantly correlated with the SO2 concentration. Morbidity was highest in the coastal section, followed by the industrial area.

32822 **APTIC NO. 54202**

Uchiyama, T.

STUDIES ON THE PREVENTION AND TREATMENT OF LUNG DISTURBANCES BY OXIDANTS; THE RELATIONSHIP BETWEEN THE BIOCHEMICAL CHANGE OF THE LUNG AND VITAMIN E. *(Okishidanto hai shogai no yobo to chiryo no kokoromi-hai no seikagaku-teki henka to bitamin E no kanren). Text in Japanese. Clinician, no. 219:24-28, June 1973.*

The peroxidation of lung phospholipids by ozone and nitrogen dioxide was studied. Rats administered with vitamin E or vitamin B2-butyrate (5 mg/100 g b w/day) for 3 days showed no peroxidized phospholipid after inhaling 100 ppm of O3 for 4 hr; rats without a preadministered dose of vitamins showed high phospholipid values after 2-4 hr. Rats which inhaled 10 ppm of O3 for 2 hr and were then given 10 mg/100 g b w of the vitamins had lower phospholipid values after 6 hr than those rats not given the vitamins.

32823 **APTIC NO. 54584**

Uzawa, Takeshi, Hiroaki Osada, Yoshidazu Isoyama, Takuyuki Nonaka, Gen Tajima, and Kazuo Horie

STEADY-STATE CO PULMONARY DIFFUSING CAPACITY IN CHRONIC PULMONARY DISEASES. *(Mansei hai shikkan kanja no kojo jotaiho CO hai kakusan noryoku sokuteichi no kento). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 11(7):391-400, July 1973. 17 refs.*

The steady-state carbon monoxide diffusing capacity of 250 patients with chronic pulmonary diseases was measured from endtidal samples (DLCO SS2). The DLCO SS2 increased with increasing ventilation until the former reached a maximum value. Since pulmonary patients often cannot engage in voluntary hyperventilation, the % DCO was used as a substitute for hyperventilation or exercise in these experiments. Low DLCO SS2 with 100% DCO indicated that oxygen consumption was low, while low DLCO SS2 with a low % DCO indicated that the oxygen consumption had reached a maximum and could be considered a real pulmonary diffusing capacity. The DLCO SS2 in bronchial asthma was within the normal range, even if the DLCO SS2 value was 9.0 ml/min/mm Hg. The DLCO SS2 value in emphysema and the pulmonary disability following pulmonary tuberculosis and fibrosis was abnormally low. Among these patients, the DLCO SS2 values were 6 to 7 ml/min/mm Hg and the % DCO was less than 50%. In addition, there were 52 patients whose DCLO SS2 values were below 9.0 ml/min/mm Hg, outside the normal range, and less than 50% of the predicted values. Nineteen of these cases developed into acute exacerbation of respiratory failure. The DCLO SS2 values in the respiratory failure group were as low as 5.6 + or 1.7 ml/min/mm Hg, with % DCO values of 35.4 + or 8.2.

32824 **APTIC NO. 54975**

Van Duuren, B. L., C. Katz, and B. M. Goldschmidt

BRIEF COMMUNICATION: COCARCINOGENIC AGENTS IN TOBACCO CARCINOGENESIS. *J. Nat. Cancer Inst., 51(2):703-705, Aug. 1973. 11 refs.*

Five cigarette smoke components were tested for cocarcinogenic activity. They were repeatedly applied to mouse skin together with a low dose of benzo(a)pyrene for 52 wks. Pronounced activity was shown by catechol and the noncarcinogenic aromatic hydrocarbons pyrene, benzo(e)pyrene, and benzo(g,h,i)perylene. Phenol had a small inhibitory effect on benzo(a)pyrene tumorigenesis. These findings have immediate practical implications in the attempts to develop a less hazardous cigarette and to reduce air pollution. They also raise the question of the mode of action of tumor promoters and cocarcinogens. The aromatic hydrocarbons might exert their effect by two mechanisms. They may enhance activating enzymes which convert benzo(a)pyrene to a proximal carcinogen. Second, the noncarcinogenic aromatic hydrocarbons are themselves converted to phenolic metabolites and these phenols may act as the proximal cocarcinogenic agents. (Author abstract modified)

32825 **APTIC NO. 54431**

Verhamme, E. N.

CONTRIBUTION TO THE EVALUATION OF THE TOXICITY OF COBALT. *Cobalt, no. 2:29-32, 1973. 35 refs.*

The literature on the toxicity of cobalt is reviewed and compared to personal observations at a cobalt plant. Some hypersensitive individuals have symptoms of irritation of the respiratory organs after a short period in an environment containing fine Co dust. After working for several years in this atmosphere some people develop symptoms of chronic bronchitis, which can progress towards complete remission once they are removed from the contaminated atmosphere. No cases of diffuse lung fibrosis with reticulonodular images, as observed on several persons exposed to complex dusts comprised of tungsten, Co, titanium, and tantalum have been detected by radiographic examination. Some cases of orthoergical or allergic cutaneous affections have been observed. Hemotological examination did not reveal any anomalously high values of the average erythrocyte and hemoglobin rates. Cobalt is not entirely harmless, but its level of toxicity is not comparable in any way to that of metals reputed to be toxic, such as mercury, cadmium, and lead. (Author conclusions modified)

32826 **APTIC NO. 54914**

Warner, P. O. and L. Stevens

REVALUATION OF THE CHATTANOOGA SCHOOL CHILDREN STUDY IN THE LIGHT OF OTHER CONTEMPORARY GOVERNMENTAL STUDIES: THE POSSIBLE IMPACT OF THESE FINDINGS ON THE PRESENT NO2 AIR QUALITY STANDARD. *J. Air Pollution Control Assoc., 23(9):769-772, Sept. 1973. 16 refs.*

Data were collected to indicate the presence of a number of biologically antagonistic air contaminants in ambient air in the immediate vicinity of Chattanooga, Tenn., resulting from the operation of the Volunteer Army Ammunition Plant. Symptoms of air-related respiratory disorders were the product of a synergistic effect resulting from exposure to a combination of pollutants of nitrogen dioxide sulfuric acid, and nitric acid mist. Symptoms which result from exposure to levels of NO2 greater than 0.083 ppm were observed in a population which was rendered sensitive by virture of background exposure to steady and/or intermittent high levels of combined acid mist (HNO3 and/or H2SO4). The adopted air quality standard of 0.05 ppm NO2 annual average is applicable for communities which show average suspended nitrates of 5.8 micrograms/cu m of the total suspended particulate and average suspended sulfates of 11.2 micrograms/cu m of the total suspended particulates. Because of the mixture of pollutants noted (NO2, HNO3, H2SO4), the known synergistic effects of these respiratory irritants must be considered. The National Air Quality Standard is unnecessarily low and does not adequately take into account the sensitivity of individuals who are coincidentally exposed to substantial levels of other pollutants but at least equally or more toxic pollutants. (Author conclusions modified)

32827 **APTIC NO. 54464**

Yelfimova, Ye. V. and M. I. Gusev

ISOLATED AND COMBINED ACTION ON THE ORGANISM OF CERTAIN TOXIC AGENTS DISCHARGED INTO THE ATMOSPHERE BY FERROUS METALLURGICAL PLANTS. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 27-34, APTD-1366. 10 refs. Translated from Russian. (Also: Uchenye Zapiski, 1968:66-74, 1968.)*

NTIS: PB 214264

Data is presented for the validation of the mean daily maximum permissible concentrations (MPC) for sulfur dioxide and carbon monoxide in conjunction with other compounds discharged from ferrous metallurgical plants. In order to validate the mean daily MPC for SO2, a three-month, round-the-clock exposure of white rats to concentrations of SO2 at 1.5, 0.5, and 0.1 mg/cu m were conducted. Changes in reflexes, hematology, metabolism, nucleic acids, and vitamin excretion were noted. Thus the mean daily MPC of SO2 of 0.15 mg/cu m is a concentration acting on the organism and should be decreased. Using previous studies of the MPC of phenol, it was established that SO2 and C6H5OH act in accordance with the principle of simple summation and the MPC should be 0.05 mg/cu m for SO2, and 0.005 for C6H5OH, when they are both present. Phenol was also studied in combination with CO and produced degeneration of the heart muscle, liver, and kidneys, plus irritation on the trachea. The MPC for CO and C6H5OH in combination should be 1.0 mg/cu m and 0.005 mg/cu m, respectively. The action of ammonia was also studied.

32828 **APTIC NO. 55294**

Yoshida, R., K. Motomiya, and M. Adachi

RESULTS OF MORBIDITY INVESTIGATION ON BRONCHIAL ASTHMA OF PRIMARY SCHOOLCHILDREN IN CHIBA CITY. *(Chiba-shi shogakko gakudo no kikanshi zensoku yushoritsu chosa kekka). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 20(10):521, Oct. 1973. (Presented at the Japan Society of Public Health, Annual Meeting, 32nd, Oct. 1973.)*

Schoolchildren in Chiba city were studied by a special health examination to correlate the degree of air pollution and the morbidity of bronchial asthma. Questionnaires regarding symptoms and medical examinations were used in the study. The city was divided into four areas according to the sulfur dioxide concentrations of 2.0-1.5 mg/100 sq cm/day, 1.5-1.0, 1.0-0.5, and less than 0.5 mg/100 sq cm/day. The morbidity of bronchial asthma was significantly correlated to the SO2 concentration in both boys and girls. The investigation was carried out on 68.8% of all schoolchildren in the area except those living in housing areas with overly high bronchial asthma morbidity. About 95% of the questionnaires were answered, and 98.4% of the children attended the medical examinations.

32829 **APTIC NO. 54903**

Zaidi, S. H., R. K. Dogra, Ravi Shanker, and S. V. Chandra

EXPERIMENTAL INFECTIVE MANGANESE PNEUMOCONIOSIS IN GUINEA PIGS. *Environ. Res., 6(3):287-297, 1973. 30 refs.*

Guinea pigs were intratracheally inoculated with 500 micrograms of Canidida albicans with is a common commensal of the upper respiratory tract of miners, 50 mg of 5 micron manganese dioxide dust, and a combination of the two in the above dosages in order to study the role of an infective factor in the course of manganese pneumoconiosis. Histopathological studies revealed that at the termination of the experiment (180 days) the combined effect of the dust and organism produced thick reticulin and collagen fibrosis in the lungs. Manganese dioxide alone produced fibrotic reaction comprised solely of thick reticulin fibers, while the organism alone produced slight lymphoid hyperplasia and no fibrosis. (Author abstract modified)

32830 **APTIC NO. 54974**

Zaidi, S. H., Ravi Shanker, and R. K. S. Dogra

EXPERIMENTAL INFECTIVE PNEUMOCONIOSIS: EFFECT OF ASBESTOS DUST AND CANDIDA ALBICANS INFECTION OF THE LUNGS OF RHESUS MONKEYS. *Environ. Res., 6(3):274-286, 1973. 24 refs.*

The combined effect of Candida albicans, a facultative pathogen in the normal physiological condition in the throat of miners, and amosite dust produces extensive collagenous fibrosis at 330 days after intratracheal inoculation in rhesus monkeys. The lesions produced by amosite dust alone comprise fine reticulin fibrosis around bronchioles and blood vessels and moderate interstitial fibrosis. The C. albicans infection alone caused acute inflammatory reaction in the early stages, while at the termination of experiment the only evidence of pulmonary candidiasis was a few small fibrotic foci of compactly arranged reticulin fibers. (Author abstract)

1972

32831 **APTIC NO. 54918**

Kobe Municipal Government (Japan), Environmental and Hygienic Div.

AN INVESTIGATION OF AIR POLLUTION IN KOBE AND THE HEALTH OF ITS CITIZENS. (1971). *(Kobe-shi ni okeru taiki osen to shimin no kenko chosa ni tsuite). (Showa 46-nendo). Text in Japanese. 57p., 1972. 11 refs.*

Epidemiological investigation of the effects of air pollution on the health of Kobe citizens was conducted in three districts: Fukae, Minato, and Karimo, in Oct. 1971 through April 1972. The order of investigation was as follows: a survey of the districts, a survey of the district population, distribution of questionnaires, recovery of the questionnaires, organization of the questionnaire data, and determination of patients requiring a health examination. The results of medical examinations and the notices for patients requiring a second examination, an interview and diagnosis by a nurse and a physican, and X-ray and cardiograph examinations followed. One thousand and fifty women between 40 and 59 years of age were given the initial questionnaire, based on the British Medical Research Council s method. The results obtained for chronic bronchitis morbidity were statistically adjusted with the elimination of the effects of age and smoking. The final morbidity for chronic bronchitis was 3.01% in Fukae, 2.68% in Karimo, and 2.83% in Minato districts. The 1971 averages of sulfur dioxide measurements were 0.80 sulfur trioxide mg/day/sq cm in Fukae, 1.26 mg for Karimo, and 1.10 mg for Minato. The 1971 settling particle measurements were better than two previous years in all three districts and were 7.54 ton/sq km/mo, 9.01 tons, and 13.97 tons.

32832 **APTIC NO. 55089**

Doershuk, Carl F.

OBSERVATIONS ON PULMONARY FUNCTION TESTING AND BLOOD-GAS ANALYSIS IN CHILDREN. *Bull. N. Y. Acad. Med., 48(4):684-688, May 1972. (Presented at the Symposium on the Care of Chronic Lung Diseases in Children, New York, Dec. 11, 1969.)*

Pulmonary function testing is most valuable when it is used in relation with the history, physical examination, and other information about the patient and when serial studies are obtained over an extended period. Many pulmonary tests involve the use of a mouthpiece, nose clips, and some degree of cooperation of the patient; and unless the laboratory is oriented toward working with children, it is probably best to wait until a child is 6 or 7 years old before initial testing. Most lung volume measurements begin with determination of the functional residual capacity (FRC), which is the amount of gas in the lungs at the resting end-tidal level. Functional residual capacity is usually measured by the open-circuit nitrogen washout, the closed-circuit helium dilution, or the total-body plethysmograph method, which is the most accurate method in obstructive pulmonary disease. All three methods can be effectively used with children over seven to eight years of age. Lung and chest-wall malfunctions are often divided into two types, restrictive and obstructive. Each type has its own lung volume and airflow characteristics, and many pulmonary disease states may utimately include elements of both types. Blood-gas analysis for sampling of arterial and arterialized blood gases has become increasingly common, though lack of familiarity has led to some confusion in interpretation of data. A decreasing level of arterial carbon dioxide tension (PaCO2) correlates well with increasing evidence of obstructive disease by pulmonary function testing, and an increasing PaCO2 is usually a very late finding in children with chronic pulmonary disease.

32833 **APTIC NO. 54302**

Hackel, R. and J. Reichert

ON THE DEMONSTRATION OF SILICOFLUORIDE POISONINGS. *(Zum Nachweis von Silicofluoride-Vergiftungen). Beitr. Gerichtl. Med., vol. 29:421-424, 1972. 4 refs. Translated from German, 7p.*

Silicofluoride poisoning was chemically demonstrated by analyzing body organs containing lethal doses of zinc fluate (ZnSiF6) for zinc. The Zn content was determined by measurement of atomic absorption after destruction of the organic material and this concentration was significantly higher than normal standards. The zinc silicofluoride intoxication was easily diagnosed in connection with the positive fluoride analysis of the stomach. Normal values for mg of Zn/100 g in blood are 0.880, in liver 5.717, and in kidneys 4.225. In the case of zinc silicofluoride poisoning, the values were 76.659 for blood, 10.575 for liver, and 11.075 for kidneys. Fluoride and silicofluoride vales were calculated from the Zn values and are expressed in mg/100 g. In Blood, the values for Zn are 76.659, for fluoride 133.675, and for ZnFiF6 243.270. In urine the values are 0.375, 0.769, 1.190; in the stomach the values are 274.325, 478.359, 870.546; in liver the values are 10.575, 18.440, 33.559; in kidneys the values are 11.075, 19.312, 35.146. The determination of the metallic cation is an effective chemical demonstration of silicofluoride poisoning.

32834 **APTIC NO. 54307**

Hulsebosch, H. J. and M. Ponec-Waelsch

THE ROLE OF SALICYLIC ACID IN ANTHRALINE PASTES, WHICH CONTAIN ZINC OXIDE. *Ned. Tijdschr. Geneesk (Haarlem), 116(44):2026-2028, 1972. 2 refs. Translated from Dutch, 8p.*

The role of salicylic acid in anthraline pastes which contain zinc oxide and are used in the treatment of psoriasis vulgaris is discussed. Salicylic acid was shown to improve the effectiveness of the pastes. It had been assumed that the ZnO reacted with the salicylic acid to form zinc salicylate. The pastes to which zinc salicylic was added were not as effective as those to which salicylic acid was added. Salicylic acid had a different action from zinc salicylate because zinc oxide contains traces of water, and alkaline zinc hydroxide molecules are formed. The salicylic acid reacts with those molecules. This reaction prevents a combination between zinc hydroxide and anthraline. In addition, less favorable conditions for oxidation of anthraline are created. Zinc salicylate, added as such, is no longer able to perform this task. The difference between the behavior of an anthraline paste, containing salicylic acid, and the behavior of an anthraline paste, not containing calicylic acid, can be observed also when the two kinds of pastes are stored. A fresh paste, containing salicylic acid, is cream colored and will maintain this light color for a prolonged storage time. Fresh paste, not containing salicylic acid, is pink and will discolor from mauve to violet during storage.

32835 **APTIC NO. 55265**

Isoard, P., E. Abrigeon, S. Fournon-Joly, J. Milhaud, J. Jacq, D. Germain, and R. Fontanges

STUDY OF BLOOD CHANGES INDUCED IN THE BALB/C MOUSE BY ATMOSPHERIC MICROCONSTITUENTS. *(Etude des modifications hematologiques induites chez la souris BALB/c par les microconstituants atmospheriques). Text in French. Pathol.-Biol., 21(6):601-610, Sept. 1972. 47 refs.*

The effect of atmospheric microconstituents of a diameter between 1 and 10 micron, collected by a vacuum aspirator which filtered 1200 cu m air/hour, on the blood of mice was studied on 1000 newborn mice of the BALB/c strain. Changes in the blood count during the first 5 months of life were studied first. Erythrocytes increased progressively from birth to the age of 2 months, then stabilized at around 10 million per cu cm. The leucocyte count decreased from birth until the end of the first month, increased during the second month, then became stable towards the fourth month at about 5000 per cu mm. At the age of 1 month leucocytes comprised 3 to 8% monocytes, 15 to 25% neutrophile polymorphs, and 68 to 78% lymphocytes irrespective of sex. The hematological effects of the atmospheric pollutants on blood count and lymphocyte cariometry were determined monthly until the fourth month inclusive by subcutaneous, intranasal, and by aerosol administration. With subcutaneous administration, circulating granulocytes increased, with the other two methods lymphocytes increased and the surface area of their nuclei decreased probably due to stimulation. The immunological processes observed changed with the presence or not of an excipient in the form of carbowax 1500 which modified the intensity of the response. The exact mechanism of the process following introduction of the pollutants may be related to the tissue change causing the appearance of antigenic properties.

32836 **APTIC NO. 54583**

Kawai, Kiyoyuki, Koyu Nozaki, Kazuo Fukuda, Yoshimi Matsumura, Satoko Shimizu, Yoko Kyono, and Nobuaki Miyata

ANIMAL EXPERIMENTS FOR INHALATION OF HEAVY OIL COMBUSTION PRODUCTS (III) - SUBACUTE EXPERIMENT - THE SIGNIFICANCE OF PARTICULATES. *(Juyu nensho seiseibutsu kyunyu dobutsu jikken (III) - akyusei jikken ryushijo busshitsu no igi). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), 1971:32-33, July 1972.*

Rats were exposed to fuel combustion product gas with an average of 6.3 mg/cu m/hr particulate concentration for 15 continuous weeks, and their lungs were observed. The main changes in the lungs were: an abnormal increase of epithelium and bronchiolitis, early stages of pneumoconiosis, swelling of alveoli walls, early inflammatory pneumofibrosis, and light and medium cases of pharyngitis. These symptoms seem to be faithful representations of symptoms for workers and residents in environments with heavy oil and other fuel heating and combustion gases. The difficulties in the previous similar experiments for pneumoconiosis and anthracosis of separating these symptoms from the influences of other types of respiratory diseases were successfully solved by a semi-barrier system of animal environment. Paralleling with this experiment, another group of animals was exposed to combustion gas from which 99.55% of particulates were eliminated by filtering. The gas components of sulfur dioxide, carbon dioxide, and nitric oxide and their concentrations were the same as those of the other group; but for this group, the symptoms were much lighter. Bronchiolitis was much lighter and there was no abnormal increase of epithelium; there was no anthracosis; and the symptoms in the alveoli were much lighter. However, the inflammation of the upper airway was generally as serious as that of the other exposure group. These facts suggest the important effect of particulates on the complex symptoms of respiratory diseases.

32837 **APTIC NO. 54613**

Kawai, Kiyoyuki, Koyu Nozaki, Kazuo Fukuda, Yoshimi Matsumura, Satoko Shimizu, Yoko Kyono, Nobuo Miyata, Tomoyuki Kuwahara, Shozo Takata, and Haruo Sugano

ANIMAL EXPERIMENTS FOR INHALATION OF HEAVY OIL COMBUSTION PRODUCT (IV) - STUDIES ON THE MULTIPLIED EFFECTS OF CARCINOGEN AND OIL COMBUSTION PRODUCTS. *(Juyu nensho seiseibutsu kyunyu dobutsu jikken). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), 1971:33-34, July 1972.*

Whether or not conditional carcinogenesis can exist between known carcinogens and fuel oil combustion products was examined by subjecting rats to a hypodermic injection of 4-Nitroquinoline-l-oxide (4NQO) and inhalation of fuel oil combustion gas. The injection was given once a week for 15 weeks in the total amount of 0.9 mg. The group that was given only these injections had no tumor growth in the lung. The inhalation group was divided into a group inhaling the total smoke with the average of 5 mg/cu m of particulates, a group inhaling filtered gas, a group inhaling gas with the average of 0.5 mg/cu m particulates, and a control group inhaling the filtered lab air. One group had bronchiolitis with abnormal increase of bronchial epithelium and another group had light cases of bronchial epithelium increase. Each group was further divided into two groups: the A group was given the 15-week 4NQO administration and then 15 more weeks of combustion gas inhalation; the B group followed the 15-week inhalation of fuel combustion gas with the 15-week injections of 4NQO. All rats were killed from 25 to 29 weeks after the completion of experiments and dissected. Generally, the 4NQO injections resulted in fibrosis or sarcosis formation in the injection area, and although tumors were often surgically removed, 40% of the rats died before the completion of the experiments. The A group showed a 2/5 morbidity in all groups of bronchiol-alveolar tumors, and the low concentration total smoke group had one case of an epidermoid-cyst combination, and one case of multi-colonies. The filtered smoke group had one case of multi-colony. Both groups showed bronchial epithelium and alveoli cell increases. Among the B groups, there was no tumor but some increase of bronchial epithelium or alveoli epithelium was recognized.

32838 **APTIC NO. 54574**

Koshi, Kimiko and Hiryouki Sakabe

EFFECTS OF ASBESTOS OR QUARTZ PARTICLES ON THE MIXED CULTURES OF MACROPHAGE AND 3T6 CELL. *Ind. Health (Japan), 10(3-4):125-127, Dec. 1972. 1 ref.*

To determine the effects of various dusts on a model system consisting of macrophage and 3T6 cells, rat peritoneal macrophages were cultured in a medium consisting of Dulbeco-Vogt medium supplemented with 10% calf serum; to this medium were added alkali treated quartz, chrysotile, amosite, crocidolite, or titanium dioxide particles. After 2 days, mouse embryo fibroblasts of the line 3T6 were added to each culture tube. Within 6 days after the addition of the fibroblasts, the number of fibroblasts in the culture containing alkali treated quartz was almost equal to that in a culture containing only fibroblasts. The number of fibroblasts in a mixed culture containing no dust had not increased since the second day after the addition of the fibroblasts. The numbers of fibroblasts in the cultures containing the other types of dust were intermediate between those containing the quartz and the control. The incorporation of 3H-thymidine into the macrophages (cultured alone) was very small on the first and fourth days of cultivation, and the uptake by the fibroblasts (cultured alone) was comparatively great. The uptake in the mixed culture without dust was smaller on the first day than in the macrophage culture, and had hardly increased by the fourth day. However, on the fourth day, the uptake of the culture containing alkali treated quartz was almost equivalent to that of the fibroblast culture alone. The uptake of the cultures containing crysolite and amosite was intermediate between those of the fibroblast culture and the mixed control culture.

32839 **APTIC NO. 55172**

Langer, Arthur M., Ivan B. Rubin, and Irving J. Selikoff

CHEMICAL CHARACTERIZATION OF ASBESTOS BODY CORES BY ELECTRON MICROPROBE ANALYSIS. *J. Histochem. Cytochem., 20(9):723-734, 1972. 35 refs.*

An electron microprobe analyzer which permits microchemical analysis of particles in the sublight microscopic size range was used to analyze asbestos body cores from tissues obtained from occupationally exposed individuals (known fiber exposure), laboratory animals (known exposure), and individuals with no known occupational exposure. Body cores were analyzed as amosite, chrysotile, chemically degraded chrysotile, and cores of undetermined nature. Amosite fibers in the cores and bodies which had been present in the lung of a person for at least 10 years prior to death were chemically identical to the materials of exposure; they appeared to have undergone no marked chemical degradation in vivo. Analyses of chrysotile fibers recovered from human and animal tissues indicated that only in a few cases does the chrysotile remain unaltered. It appears that chrysotile is readily leached of magnesium while in vivo. Analyses of asbestos body cores obtained from lung tissues of individuals in the general population indicated composition of a number of materials which include chemically degraded chrysotile, extruded silicate fiber, and amphibole asbestos. The meaning and significance of these observations were limited by the micromanipulation technique for selection of the bodies.

32840 **APTIC NO. 54299**

Levshin, B. I.

CHANGES IN THE ACTIVITY OF BLOOD SERUM LACTATE DEHYDROGENASE ISOENZYMES OF RATS DURING EXPERIMENTAL PHARMACOTHERAPY OF TOXIC HEPATITIS WITH SELENIUM AND THIAZOLIDINE DRUGS. *(Izmeneniye aktivnosti izofermentov laktatdegidrogenazy syvorotki krovi u krys pri farmakoterapii toksicheskogo genatita preparatami selena i tiazolidina). Farmakol. i Toksikol. (Moscow), 35:195-198, April 1972. 6 refs. Translated from Russian, 7p.*

Changes in the activity of blood serum lactate dehydrogenase (LDH) isoenzymes of rats were investigated during experimental pharmacotherapy of toxic hepatitis with selenium and thiazolidine drugs. Toxic hepatitis was induced in 180 male rats by the daily subcutaneous administration (over a period of 4 days) of carbon tetrachloride in a 50% oil solution in a quantity of 0.4 ml/100 g of weight. The total LDH activity was increased on the seventh day of intoxication. A more sensitive index of toxic damage to the liver is an increase in activity of the isoenzyme LDH5 which was already noted on the third day of intoxication. The following drugs exerted a normalizing influence on activity of the isoenzyme LDH5 and the total activity of blood serum LDG: sodium salt of 4-thiazolidine carboxylic acid, sodium selenite, seleophene-5, selenophene-6, and vitamin B12. Hydrocortisone did not normalize total LDH activity and the activity of LDH in particular. (Author abstract modified)

32841 **APTIC NO. 54357**

Miura, Kenji, Toshihiko Seki, Tadasu Sugano, Norio Meguriya, Ko Tsunoda, Moroyaji Kondo, Tsutomu Watanuki, and Nakao Ishida

HISTOLOGICAL OBSERVATIONS AND THE AMOUNT OF LEAD IN THE ORGANS OF MICE RAISED IN THE STREETS. *(Rojo shiiku mausu no zokichu enryo to soshiki shoken) Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 3:114-116, March 1972.*

Twenty mice each were raised in screen boxes placed at three locations on the streets of Sendai and on the roof of the Municipal Institute of Public Health between July and October 1970, to see the effects of air pollution on animals. The weight measurements were taken weekly, and the final weight, the weight of internal organs, the lead content in the organs, specific blood density, hemoglobin, and histological images of the organs were examined. The amounts of traffic, suspended particles, carbon monoxide, lead in the air, and noise were measured. The traffic amounts at two busy sections were approximately 4500 and 4200 vehicles/hr; suspended particulate counts were 1.66 and 1.61 mg/m; CO counts were 10 and 8.7 ppm; and lead counts were 3.5 and 2.7 micrograms/m. The measurements of specific blood density, intestinal organ weight, and hemoglobin were all within the normal range, and the four locations showed almost no difference. The lead content in the organs were: 0.09-0.192 micrograms/g in the lung, 0.106-0.202 micrograms/g in the liver, and 0.039-0.181 micrograms/g in the kidney; considerable differences were noted depending on the location; but there was no special pattern or correlation. In the lung, the dust deposit variations showed a definite tendency; at all four locations, the left lung had more deposit than the right lung, and the averages were higher in the order of the degree of pollution.

32842 **APTIC NO. 54594**

Nakai, Kazuo, Yukio Kobayashi, Saburo Iizaka, Kazue Watanabe, Yoshihisa Matsumoto, Kiichiro Kobayashi, Chieko Tanaka, Sakuko Niwa, and Michiko Akashi

ENVIRONMENTAL FACTORS RELATED TO THE AGGREVATION OF THE TAISHIDO JUNIOR HIGH SCHOOL VICTIMS OF AIR POLLUTION. *(Taiki osen busshitsu ni yoru to omoware ru Taishido Chugakko higai shojo no akka ni kansuru kankyoteki yoin ni tsuite). Text in Japanese. Tokyo-to Eisei-Kyoku Gakkai-shi (Rept. Tokyo Public Health Studies), no. 50:104-105, Oct. 1972.*

On june 21, 1972, 104 pupils of the Taishido Junior High School were affected by photochemical smog. An investigation revealed that there were some previous incidents earlier in the month, and by July 19, the total number of victims were 839 in this school. The residents nearby were interviewed and 27 persons were affected (12.3%) on June 22. The locations of most frequent occurrence were the classrooms including the gym. In the residence area, morbidity in the southern low slope was low and the four-storied housing on the east side of the school had a high rate of morbidity. Most incidents occurred in the afternoon, toward 3 o clock. Subjective symptoms included eye irritation, headache, throat pain, breathing difficulty, and nausea. Generally, female students were affected more than male, and adult females in the area felt nausea and enervation more frequently. When oxidant concentration (pphm) multiplied by the wind velocity (m)/sec was over 20, incidents tended to happen. When the pollutant concentration was at a certain level, localized wind velocity seemed to affect the pollutant damage. High temperature in the classroom, lack of ventilation, physical activities, and science or cooking experiments contributed to the discomfort of the pupils. The need for more adequate methods of basic weather observation was felt.

32843 **APTIC NO. 54702**

Neyman, I. N.

ON THE POSSIBILITY OF THE DETERMINATION OF MAXIMUM ALLOWABLE DOSES FOR CARCINOGENIC SUBSTANCES. *(O vozmozhnosti opredeleniya predel nykh doz kantserogennykh veshchestv). Text in Russian. Gigiena i Sanit., no. 5:90-93, May 1972. 20 refs.*

Determination of a maximum allowable dose of carcinogenic substances, such as polycyclic aromatic hydrocarbons, and of conditionally carcinogenic substances such as carbon tetrachloride is discussed. The determination of maximum allowable doses or maximum ineffective doses for such substances is presently not possible, since no highest ineffective doses of such carcinogens have yet been found. Small doses of such carcinogens as methylcholanthrene, benzopyrene, dibenzanthracene, and ortho-aminoazotoluene, which failed to cause tumors in the test animals, increased the susceptibility of the organism to the same substances and to other carcinogens with different mechanisms of tumor induction. Although there are no maximum allowable doses for carcinogens available, their emissions by industry, motor vehicles, and households should be reduced as much as possible. Direct relationships between carcinogen concentrations, tumor frequency, and latency time was established in several animal tests.

32844 **APTIC NO. 55021**

Norval, Elsa and L. R. Butler

THE DETERMINATION OF LEAD IN BLOOD BY ATOMIC ABSORPTION WITH THE HIGH-TEMPERATURE GRAPHITE TUBE. *Anal. Chim. Acta, 58(1):47-56, 1972. 15 refs.*

The use of the high-temperature graphite tube with atomic absorption constitutes an exceptionally sensitive analytical method and is especially suitable for the determination of lead in whole blood. The tube technique involves placing the sample in a tube which is heated by means of electrical resistance rather than by aspirating the sample into a flame. The coefficient of variation calculated on 11 human blood analyses of the same sample was 10.5%, and with some kind of background correction the reproducibility of the method could be improved. The detection limit for lead may be conservatively set at 0.5 ng when the 283.3 nm resonance line is used. The technique is much more rapid than present techniques, and only very small quantities of sample are needed. Little sample preparation is required, and the possibilities of contamination are kept to a minimum since the ashing is done in the cuvettes.

32845 **APTIC NO. 54596**

Oyagi, Shigeo, Masako Yoneda, Shigeo Shibamoto, Ryo Hatanaka, and Yoshino Nakashima

THE RELATIONSHIP BETWEEN CARBON MONOXIDE CONCENTRATION IN BREATH, SMOKING, AND THE DISTANCE BETWEEN LIVING QUARTERS AND TRAFFIC ROADS. *(Kokichu CO nodo to kitsuen no yumu narabini kyojuchi no jidosha doro yori no kyori to no kankei). Text in Japanese. Tokyo-to Eisei-kyoku Gakkai-shi (Rept. Tokyo Public Health Studies), no. 50:102-103, Oct. 1972.*

Thirty-five males and 102 females over 20 years of age living in various areas were given a test for carbon monoxide in their breath, and the relationships with smoking habits and with the distance of their houses from heavy traffic roads were examined. The CO concentration at the heaviest traffic intersection was 4.8 ppm (maximum measurement 10 ppm), and the amount of traffic in one area was 2500 cars/hr and in another area 6400/hr. A deep breath was stopped for 20 sec, from 2/3 to 4/3 was exhaled, and the remainder was sampled in a vinyl bag. The sample was analyzed within 48 hr by an infrared CO analyzer. Carboxyhemoglobin was calculated from the measurement, using the Ringold formula. The effect of smoking was most remarkably manifest. Seventy-two percent of the males and 8.4% of the females were smokers, and the average smoking amount was 10-60 cigarettes for males and 1-7 for females. The CO concentration average for males was 23.16 ppm, and for females 8.2 ppm; this meant the male COHb was 5.1% and the female COHb was 2.1% among smokers. The distance between the living quarters and main traffic roads had some influence on the CO level. Nonsmokers who lived within 50 m from the highway had the average of 3.91 ppm. However, inhalation of CO means inhalation of other substances in automotive exhausts such as lead or benzypyrene. Therefore, measurement of CO in breath can be regarded as a very useful, simple index method.

32846 **APTIC NO. 54726**

Reiter, R., W. Carnuth, and K. Poetzl

ON RETENTION OF RADIOACTIVE LABELLED AEROSOL PARTICLES OF DIFFERENT KINDS IN THE HUMAN RESPIRATORY TRACT. *(Zur Abscheidung radioactiv markierter Aerosolpartikel unterschiedlicher Beschaffenheit im menschlichen Atemtrakt). Text in German. Atomikernenergie, 20(1):79-88, 1972. 29 refs. (Translation available from TRANS-CHEM, Inc., P. O. Box 6219, Knoxville, Tenn. 37914 as C214037.)*

Total particle deposition in the human respiratory tract was determined on human subjects within a diameter range from 0.08 micron up to 4 micron (aerodynamic diameter). A natural aerosol from an abandoned mine gallery, zinc oxide smoke, and fine particles of ZnO and magnesium oxide produced by a flame-type aerosol generator were tested. Measuring particle size distribution was done by Goetz aerosol spectrometer, trapped radon decay products, cascade impactor, and a Royco counter with a subsequently added multichannel analyzer. Evaluation of the measured data was done by computer. In the range of an aerodynamic diameter from 4 to 0.08 micron, the probability of deposition drops from 78% to 11%, and no increase is apparent as a result of diffusion deposition increasingly taking effect down to 0.08 micron. (Author abstract modified)

32847 **APTIC NO. 54906**

Saito, Kazuo

ELECTROENCEPHALOGRAPHICAL STUDIES ON THE EFFECT OF COMMERCIALLY AVAILABLE LEADED AND NONLEADED GASOLINE ON RATS. *Hokkaido Igaku Zasshi (Hokkaido J. Med. Sci.), 47(5):472-480, Sept. 1972. 34 refs.*

Electroencephalographic studies on three groups of Wistar rats administered non-leaded white gasoline (WG), leaded regular gasoline (RG), and leaded high-octane gasoline (HG) at the rate of 1 ml/100 g body weight revealed significant differences between the leaded and non-leaded types. The death rate increased in proportion to the amount of tetraethyl lead contained in the gasolines as evidenced by the HG group having the highest death rate and the WG group the lowest. The surface cortex EEG of rats injected with HG changed from dominant theta to non-dominant theta and dominant beta several hours before death and one to three days after injection. These rats also showed ataxia, drowsiness, dullness, nystagmus, convulsions of extremities, and lowered body temperature. The WG group showed the nearest to normal EEG 10 days after injection. The most severe electroencephalographic state occurred for HG rats after 2 days and for RG rats after 3 days. The WG group was near the control 5 days after injection. Comparison of the EEGs of the rats which survived and those which died following administration of leaded gasoline 24 and 48 hr prior showed a 20% decrease of the theta wave and about a 50% increase of the beta 1 and beta 2 waves for those which died. The air pollution due to lead in exhaust gases of automobiles caused by the lead in gasoline is an important problem.

32848 **APTIC NO. 54787**

Salhany, J. Mitchell, Daniel H. Mathers, and Robert S. Eliot

THE DEOXYGENATION KINETICS OF HEMOGLOBIN PARTIALLY SATURATED WITH CARBON MONOXIDE. EFFECT OF 2,3-DIPHOSPHOGLYCERATE. *J. Biol. Chem., 247(21):6985-6990, 1972. 27 refs.*

The deoxygenation rate of human hemoglobin solutions partially saturated with carbon monoxide in the presence and absence of 2,3-diphosphoglycerate (2,3-DPG) at 23 C and pH 7.0 and 8.0 were measured. Solutions containing 98% HbO2 demonstrated an increase in rate as hemoglobin deoxygenated both at neutral and alkaline pH when the rate was calcuated over the initial 30% of the reaction, while partial saturation with CO severely compromised this variation at both pH values. No variation in rate was observed over the initial 30% of the reaction or thereafter for a solution containing about 15% HbO2. Values of the deoxygenation rate constant calculated between 85 and 40% saturation at pH 8.0 in the absence of 2,3 DPG wery 19.5 plus or minus 1.0 s to the minus 1 for 98% HbO2 and 14.2 plus or minus 0.7 s to the minus 1 for 85% HbCO-15% HbO2. No significant effect was exerted by 2,3 DPH on the observed rate constant at pH 8.0. The value of the rate constant at pH 7.0 with no 2,3 DPG for the 98% condition was 36.0 plus or minus 1.8 s to the minus 1 and 17.9 plus or minus 0.9 s to the minus 1 for the 85% condition. The effect of partial saturation with CO was even more pronounced in the presence of a 10:1 molar ratio of 2,3 DPG to hemoglobin tetramer. These results support the view that 2,3 DPG has no effect on the release of the first oxygen from the fully liganded conformation while results from observing other hemoglobin species and their rate change suggest that 2,3 DPG does exert an influence on the rate of removal of the second and subsequent oxygen molecules. Transition from the oxy to the deoxy quaternary structure at pH 7.0 appears to occur very early in the deoxygenation process, probably with the loss of the first heme ligand. (Author summary modified)

32849 **APTIC NO. 54319**

Schimmel, Herbert and Leonard Greenburg

A STUDY OF THE RELATION OF POLLUTION TO MORTALITY NEW YORK CITY, 1963-1968. *J. Air Pollution Control Assoc., 22(8):607-616, Aug. 1972. 2 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 1971, Paper 71-32.)*

The relationship of pollution to mortality was investigated in New York City from 1963-1968. Three types of data were used: over one half million death certificates each including date and cause of death; two daily mean pollution variates, sulfur dioxide and smoke shade; and daily weather variates including mean temperature. A linear model was developed on the basis of which excess deaths attributable to pollution could be estimated. Mortality variates were regressed on same day pollution variates and previous days. Three different estimates were obtained according to whether the regression was made on Crude Pollution (highest), Temperature Corrected Pollution (intermediate), or Fully Adjusted Pollution variates (lowest). The principal cause for the difference in the size of estimates is the extent to which the seasonal pattern of mortality is attributed to seasonal pattern of pollution. The lowest estimates tended to underestimate the effect of pollution on mortality, while the highest estimates overestimated the effects. The estimated average daily excess deaths ranged from 18.12 to 36.74 with an intermediate estimate of 28.63. This represents about 10,000 deaths a year or 12% which would not have occurred at the time they did, if there had been no pollution on the day of death or on immediately preceding days. The following additional analyses were made: correlation and partial correlation matrices, cross correlation functions, the possible effects of other weather variates (humidity, precipitation, and wind speed), and a special analysis for the six health districts surrounding the laboratory station at which pollution was measured. (Author summary modified)

32850 **APTIC NO. 54359**

Seki, Toshihiko, Yukifumi Abe, Hidehiko Hoshikawa, Mitsuo Kumasaka, Takashi Miura, Kiyomi Koide, Kiyoshi Kajiwara, Keizo Miyazaki, Kenji Miura, Tadasu Sugano, Norio Meguriya, and Ko Tsunoda

THE EFFECTS OF LEAD IN AUTOMOTIVE EXHAUSTS ON THE HUMAN BODY. *(Jidosha haiki gasu ni yoru namari kogai no jintai ni taisuru eikyo ni tsuite). Text in Japanese. Sendai-shi Eisei Shikensho-ho (Sendai Munic. Rep. Inst. Pub. Health), no. 3:203-214, March 1972. 4 refs.*

The health of residents and the environment at four locations in Sendai were investigated from August 1970 to March 1971. Various clinical examinations were given to 119 residents to see the state of lead poisoning. A questionnaire, an interview, internal examinations, hemotological examinations, urinalysis, and the lead analysis of hair were given, and carbon monoxide and lead in the atmosphere were measured. The methods for the lead analyses in blood, urine, hair, and the atmosphere are described. The blood lead ranged between 1.5 and 30.0 micrograms/dl (average, 13.4); the urine lead ranged between 1.9 and 29.2 micrograms/l (average, 10.5). Both were within the range of normal healthy persons. The lead content in hair ranged between 0.5 and 62.2 micrograms/g (average, 12.1) and could be regarded as normal. These measurements compare favorably with the published data of lead-poisoned workers in Osaka, such as the 168.1 micrograms/g average of rayon factory lead workers or the 217.3 micrograms/g average of battery recycling plant workers. There was no indication for lead poisoning among the residents examined. The lead concentrations in the atmosphere at three locations were 0.74, 0.62, and 0.73 micrograms/cu m, and these figures were about 1/2 of the maximum allowable concentration designated for a labor environment.

32851 **APTIC NO. 54294**

Spynu, Ye. I., K. K. Vrochinskiy, T. D. Zoryeva, and N. N. Manko

COMPREHENSIVE HYGIENIC STANDARDIZATION OF NEW PHOSPHORORGANIC PESTICIDES IN ENVIRONMENTAL OBJECTS. *(Kompleksnoye gigiyenicheskoye normirovaniye novykh fosfororganicheskikh pestitsidov v obyektakh vneshney sredy). Gigiena i Sanit., no. 11:96-99, 1972. 14 refs. Translated from Russian, 8p.*

The principle of comprehensive hygienic standardization is explained and used in the development of hygienic standards for phosphororganic pesticides. It includes the following steps: experimental toxicological studies and generalization of their results to establish the permissible safe dose (DM) for animals; determination of DM for man based on the comparative sensitivity of man and animals to the preparations, determination of the actual pesticide content in various media, the specific proportion of each medium in DM for man and calculation of the standard in the medium, based on DM for man and the medium; comparison of DM for man with the total amount of pesticide which can enter the human organism in contact with various media. If the total amount of the preparation does not exceed the DM for man, the maximum permissible concentration, and the permissible total concentration are recommended in various media. If the total amount of the preparation is greater than DM for man, then appropriate regulations must be made to reduce the amount of the substance or even prohibit the use of the pesticide. Effective and recommended standards were determined for six pesticides in food (md/kg), water (mg/l), and air (mg/cu m), respectively; cydyal 0.1, 0.05, 0.001; phozalon 0.2, 0.001, 0.007; phenocapton 0.25 (food); phthalaphos 0.3, 012, 01002; DDFV 0.05 (food), 0.002 (air); and sayphos 1(food), 0.09 (water).

32852 **APTIC NO. 54358**

Sugi, Yasusaburo, Hidehiko Tanaka, Tomomori Fujita, and Kunio Ishiguro

ADAPTATION TO THE CONSISTENCY OF CARBON MONOXIDE OF LIVING BODY. *(Issanka tanso nodo to seitai no tekioryoku). Text in Japanese. Nippon Seirigaku Zasshi (J. Physiolog. Soc. Japan.), 34(8-9):480, Sept. 1972.*

The effects of the physical training and the adaption of the body to low concentration of carbon monoxide were examined by exposing acclimated mice to high concentrations of CO and comparing the time to die. The weight of the suprarenal gland, the 17-KS value in urine, and the body weight were also examined. Physical exercises were given to the mice for 10-20 min/dy on a 20 m/min treadmill. Mortality of 600, 1000, and 1500 ppm concentrations of CO were compared between the control group and the trained group; the trained group died 10-50 min after the control group. There was no difference in high concentrations of 2000 and 2500 ppm CO. When mice were acclimated in low concentrations of 400 and 600 ppm once a day for 10 min/wk and then exposed to 1000 and 2000 ppm of CO, death was deterred considerably, and showed that the acclimated group had much more tolerance against CO than the control group.

32853 **APTIC NO. 55164**

Tepper, Lloyd B. and Linda S. Levin

A SURVEY OF AIR AND POPULATION LEAD LEVELS IN SELECTED AMERICAN COMMUNITIES. *Cincinnati Univ., Ohio, Kettering Lab., Environmental Protection Agency Contract PH 22-68-28, Program Element 1H1099, EPA-R1-73-005, 78p., Dec. 1972. 6 refs.*

NTIS: PB 222459

The concentration of lead in the ambient atmosphere was determined at 59 sites in eight American communities during the period 1968-1971. The observed annual mean atmospheric concentration varied from 0.14 micrograms/cu (Los Alamos) to 4.55 micrograms/cu m (downtown Los Angeles); higher lead values were associated with urbanization. Among three urban human populations, the mean blood lead levels were higher than among three suburban populations from the same metropolitan areas; in two of these areas, the blood lead levels among urban smokers and nonsmokers were higher than among suburban smokers and nonsmokers. At each location, the concentration of lead in the blood of smokers was higher than that in the blood of nonsmokers. The magnitude of the observed urban-suburban difference ranged from 0.9 to 4.5 micrograms/100 g. There were no significant correlations between mean air lead levels and the mean blood lead concentrations of the related populations, nor was there any relationship between age and blood lead level. Among husband-wife pairs, the males had significantly higher blood lead concentrations; these differences were not attributable to smoking habits or hematocrit levels. Dietary lead intake levels were 100 micrograms/day. (Author summary modified)

32854 **APTIC NO. 54888**

Toyama, Toshio

A MEDICAL OBSERVATION OF THE EFFECTS OF PHOTOCHEMICALLY REACTIVE AIR POLLUTANTS ON THE BODY. *(Sosetsu Kokagaku hanno ni yoru taika osen seibun no seitai eikyo no igakuteki kosatsu). Text in Japanese. In: Kokagaku Hanno ni yoru Taiki Osen (Air Pollution by Photochemical Reaction). Japan Public Health Assoc., p. 111-122, Sept. 1972. 37 refs.*

The effects of oxidants, photochemical smog, peroxyacetyl nitrate, nitric oxide, nitrogen oxide, sulfur dioxide, and ozone, are reviewed. Past experiments include the inhalation experiment with sulfur dioxide, nitrogen dioxide, and two particle size aerosol combination and their effects on the airway resistance. The SO2 showed a uniform increase of 20% or more resistance in the upper airway, regardless of particle sizes.

Nitrogen dioxide and large particles caused an increase of resistance in the upper airway, but small articles caused no airway resistance. The invasion rate of SO2 in the upper airway is 20%, and that of NO2 in the lower airway (bronchi and alveoli) is 100%. The natural atmosphere always contains 0.02-0.04 ppm ozone, but automobile exhaust gases and industrial pollution create extraordinarily high concentrations of ozone under the solar ultraviolet rays. The recent experiment using phenolic antioxidant for reducing oxidation in vitro is reviewed. Also the experiment using erythrocytes in vitro for the destruction of cell membrane nonsaturate aliphatic acid by ozone is mentioned. The effect of vitamin E as an antioxidant is briefly mentioned.

32855 **APTIC NO. 54598**

Tsunetoshi, Yoshizo and Toyohiko Adachi

A CLINICAL VIEW ON THE PHOTOCHEMICAL SMOG INCIDENT AT THE TAKAISHI JUNIOR HIGH SCHOOL. *(Takaishi chugakko nado ni okeru iwayuru kokagaku sumoggu jiken no rinshoteki chiken). Text in Japanese. In: Kokagaku hanno ni yoru taiki osen (Air Pollution by Photochemical Reaction). Japan Public Health Assoc., p. 157-169, Sept. 1972. 2 refs.*

On Aug. 27, 1972, between 2-5 pm, during a photochemical smog warning, 10 children were carried into the Sakai Municipal Hospital. On Sept. 2, about 4:30 pm, also during a photochemical warning, two deaf-dumb students were brought into the same hospital with rather serious symptoms. Most of these 12 patients had serious inflammation of mucous membranes in the eyes and the upper respiratory system, and a temporary blockage of peripheral circulation. These symptoms were similar to the 1970 photochemical smog incident in Tokyo, but the inflammation of mucous membrane seemed much more advanced in the case of Sakai. Also, unlike the Tokyo incident victims, blood pressure had not dropped. Nausea, dizziness, headaches, and enervation disappeared in about 5-60 min, but the eye inflammation remained for 1-2 hr. The upper respiratory mucous membrane inflammation remained for a long time. The one case of edema in the glottis suggested a very strong inflammation. The increase of leukocytes occurred in many patients. The blood samples were taken about 2 hr after the incident. The increase of leukocytes reaches its peak 2-3 hr after exposure to ozone. These cases seemed to follow the pattern, and when the two patients on Sept. 2 were examined again in 18 hr, the leukocyte counts had returned to normal. One patient showed a slightly high alkaline phosphotase, but a followup test showed a normal count.

32856 **APTIC NO. 54921**

Tsuruta, Hiroshi, Mitsuo Sato, and Hiromichi Hasegawa

32857 **APTIC NO. 55005**

Zedda, S., G. Aresini, and E. Sartorelli

THE PULMONARY DIFFUSION CAPACITY IN NORMAL SUBJECTS AS MEASURED AT REST AND UNDER WORKLOAD BY THE STEADY-STATE CO METHOD. *(Comportamento della capacita di diffusione polmonare a riposo ed in lavoro nei soggetti normali valutata con un metodo al CO in regime stabile). Text in Italian. Prog. Med. (Rome), vol. 28:127-134, 1972. 51 refs.*

One hundred and twenty-three normal subjects, 18 to 60 years, were tested in order to study the carbon monoxide diffusing capacity of the lung (DLCO) by a steady state method at rest and at two work loads (50 and 100 watts). The mean (DLCO) value at rest was 21.5 ml/min/mmHg with a standard deviation of 7.4 ml/min/ mmHg and with a lower limit of 11.6 ml/min/mmHg. The mean DLCO value rose up to 39.7 plus or minus 7.5 at 50 watts and to 49.3 plus or minus 8.4 at 100 watts during exercise; the lower limits were, respectively, 24.4 and 31.0. The scattering of the values was chiefly conditioned by the variability of the pulmonary ventilation and of the tidal volume in particular. The coefficient of variation was lower at work than at rest. A poor relation between DLCO values and age, height, weight and body surface was recorded.

32858 **APTIC NO. 55004**

Zetterstrom, Olle, Erik Fagerberg, and Leif Wide

AN INVESTIGATION OF POLLEN EXTRACTS FROM DIFFERENT DECIDUOUS TREES IN PATIENTS WITH SPRINGTIME ALLERGY IN SWEDEN. *Acta Allergol., 27(1):15-21, 1972. 4 refs.*

Ten patients with a clinical history of springtime allergy in Sweden were investigated by means of intracutaneous tests (i.c.), provocation tests, and radioallergosorbent tests (RAST) for reagins in serum against pollen extracts from eight different springtime flowering trees. The strongest allergen was found to be birch, followed by alder and oak. This corresponds well with the analysis of air pollen frequency which shows that birch pollen is always the dominating element (50-90% of the tree pollens), followed by alder (5-30%). The frequencies from deciduous trees other than birch and alder in central Sweden is less than 10%. All of the patients had clinical symptoms from birch pollen, while four of them were also sensitive to alder. The possible role of oak pollen was uncertain, while the other five pollens investigated probably had no clinical significance. Birch pollen extracts were able partially or totally to inhibit the reactions to all other pollen extracts, showing that birch extract contains several allergens or allergenic determinants of which at least one is present in the other extracts. Radioallergosorbent test reactions to birch were partially inhibited by extracts from alder and to a lesser extent oak, indicating that some of the reagins which reacted with birch also have affinity for alder and oak extracts.

1971

32859 **APTIC NO. 54447**

Cornillon, J., E. Gueno, J. P. Bernard, and R. Touraine

ESTIVO-AUTUMNAL POLLINOSIS IN THE LYONS REGION. *(Les pollinoses estivo-automnales dans la region lyonnaise). Text in French. Lyon Med., 226(15):309-312, Oct. 10, 1971. 6 refs. 54326 Honma, Katsunori STUDIES ON THE INHALATION OF HEAVY METAL AEROSOLS - THE EFFECTS OF PARTICLE SIZES OF LEAD AND TELLURIUM AEROSOLS ON THE PULMONARY DEPOSITION RATE. (Jukinzoku earozoru no kyunyu ni kansuru kenkyu - namari oyobi teruru earozoru no ratto hainai e no tairyu-ritsu ni oyobosu ryukei no koka). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), 1970:35-36, July 1971.*

Fume inhalation experiments were conducted by a newly designed high frequency heating fume producer which can produce any particle size various metal fumes. Lead (specific weight, 11.34) and tellurium (specific weight, 6.2) fumes of sizes between 0.05 and 1.5 micron were produced by this apparatus, and rats were exposed to various types and sizes to see the effects of the specific weight and the particle size on the rate of pulmonary deposition. A new type of inhalation chamber was designed so that the rats could be stabilized while inhaling the fume. The results were found far superior to those of the previous type of exposure chamber, with an average of 30% increase in the deposition and less fluctuation among the six rats grouped together for one type of exposure. The inhalation time was 90 min for all rats. The depositions were measured by atomic absorption spectrophotometry. The deposition rate was generally lower for larger particles for both lead and tellurium. Adjustments were made by the aerodynamic particle size; the deposition rate of lead was lower than that of tellurium. With 1-micron particles, the lead deposition was approximately 30% less than that of tellurium, and with 3 micron size, about 60% less. These results suggest that heavy metal aerosol deposition may be controlled by factors other than the inertia deposition based on aerodynamic particle sizes.

32860 **APTIC NO. 55020**

Jervis, R. E.

ACTIVATION ANALYSIS APPLICATIONS TO PUBLIC HEALTH PROBLEMS. *Trans. Am. Nucl. Soc., 14(1):102-103, 1971. 9 refs.*

Recent laboratory studies utilizing neutron activation analysis have revealed appreciable residues of mercury (at the ppb to ppm levels) in human hair, foods, fish, wildlife, and river and lake bottom sediments. Hair samples from fisheaters and persons exposed to unusual amounts of mercury compounds have been analyzed and indicate: normal contents range from 2 to 5 ppm; marginal exposures up to 20 ppm, fisheaters to 100 ppm, and persons exhibiting toxicity between 200 to 1000 ppm. Arsenic levels in hair of smelter workers and their families, selenium in persons occupationally exposed, and cadmium in hair, blood, water, and vegetation have also been measured to assess public health hazards. The nuclear techniques for trace analysis have been generally subject to fewer sources of error than other methods.

32861 **APTIC NO. 542[illegible]9**

Jodoin, Gilles, G. W. Gibbs, P. T. Macklem, J. C. McDonald, and Margaret R. Becklake

EARLY EFFECTS OF ASBESTOS EXPOSURE ON LUNG FUNCTION. *Am. Rev. Respirat. Disease, 104(4):525-535, Oct. 1971. 34 refs.*

The early effects of asbestos exposure on lung function were investigated. Detailed studies, including tests of pulmonary mechanics, were made on 24 asbestos workers who had normal chest radiographs but whose exposure to asbestos ranged from 6 months to 24 years. The 13 men with greater exposure showed a significant 30% increase in the static recoil of the lung when compared with the 11 men with the lesser exposure. In addition, they had smaller vital capacities, evidence of greater regional inhomogeneities of ventilation, and larger maximal mid-expiratory flows, changes in keeping with the presence of restrictive type of lung disease. By contrast, at any given transpulmonary pressure, peak flow was less in most of the men in the more exposed group, indicating an increased upstream resistance. It was suggested that the changes responsible for the increased elastic recoil had a peribronchiolar rather than an alveolar location, in keeping with what was shown in laboratory animals. The changes in pulmonary mechanics were considered to be early because they occurred in men who had no radiographic evidence of disease or definitive changes in other measurements of lung function. The findings suggest that exposure to asbestos dust is another cause of obstructive disease of small airways. (Author abstract)

32862 **APTIC NO. 55151**

Jonek, Jan, Marcin Kaminski, Henryk Grzybek, and Barbara Panz

STUDIES ON ULTRASTRUCTURE OF LIVER CELLS IN RABBITS IN SUBACUTE BENZENE POISONING. *(Badania ultrastruktury komorek watrobowych w podostrym zatruciu benzenem). Text in Polish. Patol. Polska (Warsaw), 22(4):641-651, 1971. 20 refs.*

Tests were conducted on 14 male sexually mature rabbits, with a weight of 2.5 kg, in experimental and the control groups of the ultrastructure of liver cells in subacute benzene poisoning. The rabbits were poisoned with benzene vapor in concentrations of 10 mg/l. for 14 days for 6 hr/day in a glass chamber with a 40 l capacity at room temperature, with a continuous air flow of 7000 l/hr traffic capacity. Research results indicated a proper distribution of organella in the control group animals. In the liver cells of the poisoned animals, marked hypertrophy of the smooth endoplasmatic reticulum of the tubular type, disappearance of ergastoplasm, its segmental distension, and a tendency to loss of ribosomes were observed. The mitochondria showed structural changes, from swelling to myelin degeneration. Some of the liver cell nucleoli showed segregation of a fibrous and granular part. The concept of a toxic influence of benzene on liver cells is discussed.

32863 **APTIC NO. 54279**

Kuncova, Magdalena, Jaroslava Havrankova, Radim Holusa, and Frantisek Palecek

EXPERIMENTAL SILICOSIS OF THE RAT. CORRELATION OF FUNCTIONAL, BIOCHEMICAL, AND HISTOLOGICAL CHANGES. *Arch. Environ. Health, 23(5):365-372, Nov. 1971. 18 refs.*

Lung function, biochemistry, and histology were examined in 34 sllicotic and 29 control rats. Silicosis was produced by intratracheal injection of 50 mg of quartz dust. Pulmonary function tests 4 months after dusting showed the following changes in the silicotic rats: increased in frequency of breathing, functional residual lung capacity, lung resistance, work of breathing, oxygen consumption, and carbon dioxide tension of aortic blood; and decreased lung compliance and oxygen tension of aortic blood. Biochemical studies revealed a more than fivefold increase in wet weight of silicotic lungs and an eightfold increase in total amount of hydroxyproline. Histologically, there were many fibrotic nodules present with emphysema in the remaining portions of the silicotic lungs. Correlation of morphological, biochemical, and functional changes and the importance of the animal-model experiments to functional examination are discussed. (Author abstract)

32864 **APTIC NO. 54685**

Morgan, A. and A. Holmes

STUDIES OF THE SOLUBILITY OF CONSTITUENTS OF CHRYSOTILE ASBESTOS IN VIVO USING RADIOACTIVE TRACER TECHNIQUES. *Environ. Res., 4(6):558-570, Dec. 1971. 12 refs.*

Two sets of experiments were performed involving the administration of chrysotile asbestos samples from Rhodesia, Quebec, and British Columbia to rats. The experiments demonstrated that the iron, scandium, chromium, and cobalt associated with the asbestos are soluble to some extent in vivo and that the relative solubilities of these trace metals reflect differences in distribution between the fiber and associated mineral impurities. The excretion of Co(60) can be used as an index of magnesium solubility, and the structural magnesium of chrysotile dissolves relatively fast during the first month after administration. Tracer techniques for measuring the distribution of leached fiber in the thoracic cavity following intrapleural injection revealed the highest concentration of fiber to be in the diaphragm. Fibrils from one sample of chrysotile were found in the dome of the liver and were apparently derived either by direct extension or by migration from adjacent diaphragmatic lesions.

32865 **APTIC NO. 55082**

Platonow, N. S. and H. S. Funnell

ANTI-ANDROGENIC-LIKE EFFECT OF POLYCHLORINATED BIPHENYLS IN COCKERELS. *Vet. Rec., 88(4):109-110, Jan. 23, 1971. 7 refs.*

White Leghorn cockerels given 500 ppm of polychlorinated biphenyls (PCB) in their daily ration (begining at 1 day of age) died between the third and tenth weeks of feeding. When the daily dosage was reduced to 250 ppm, mortality appeared only toward the thirteenth week of feeding. The feeding of PCB at 250 ppm for 6 weeks did not produce any noticeable changes in body weight, but by the 13th week, the PCB-fed birds weighted more than 1/3 less than a group of controls. The feed consumption of the PCB-fed birds has also visibly decreased by the end of the experiment. The liver weights of the PCB-fed birds were lower than those of the controls, although the liver weights of the former were higher in terms of percentage of body weight. The adrenal gland weights did not change as a consequence of PCB administration. By the 13th week, the combs of the control birds weighed about 20 times more than those of the treated birds, with the wattles of the latter also being significantly smaller. The testicular weights of the treated birds decreased between the 7th and 13th weeks, being only 1/2 those of the controls by the end of the experimental period.

32866 **APTIC NO. 54687**

Reeves, Andrew L., Henry E. Puro, Ralph G. Smith, and Arthur J. Vorwald

EXPERIMENTAL ASBESTOS CARCINOGENESIS. *Environ. Res., 4(6):496- 511, Dec. 1971. 50 refs.*

Laboratory rodents were exposed to one of three mineralogical types of asbestos dust, amosite, crocidolite, or chrysotile. Inhalation exposures were accomplished in chambers where ballmilled specimens of these dusts were disseminated for 4 hours daily, 4 days weekly, at a mean atmospheric concentration of about 48 mg/cu m. Additional animals were injected with these dusts intratracheally, intrapleurally, or intraperitoneally. Histopathological studies showed a fibrotic reaction in all species to all three types of dusts, with amosite provoking the strongest such response especially in guinea pigs. Two pulmonary cancers were produced in rats exposed to the inhalation of crocidolite. Local injection into the pleural or peritoneal cavities caused five mesotheliomas in rats after chrysotile treatment and six mesotheliomas in rats and rabbits after crocidolite treatment. Guinea pigs and hamsters developed no tumors in this experiment, and with the dose used, there were no tumors in any species in the amosite group. (Author abstract)

32867 **APTIC NO. 55050**

Rodkey, F. Lee, Harold A. Collison, and John D. O Neal

INFLUENCE OF OXYGEN AND CARBON MONOXIDE CONCENTRATIONS ON BLOOD CARBOXYHEMOGLOBIN SATURATION. *Aerospace Med., 42(12):1274- 1278, Dec. 1971. 20 refs. (Presented at the Toxicology Colloquium of the Joint Committee on Aviation Pathology, Oklahoma City, Okla., Oct. 12-15, 1970.)*

Blood carboxyhemoglobin has been measured in man and related to existing concentrations of oxygen and carbon monoxide in inspired air. An equation is presented to estimate the equilibrium COHb levels when the inspired air composition is known. A subject on a small closed rebreathing system at atmospheric pressure achieves equilibrium between O2, CO, and Hb in about 15 minutes. The CO in the gas phase and the blood COHb remain in essential equilibrium, increasing only as a result of endogenous CO production and accumulation. Subjects in a closed system at elevated (19 atmospheres absolute) or decreased (10 psia) pressure excrete endogenously formed CO into the restricted atmosphere leading to increases in the blood COHb and in the CO concentration in the habitat gas. (Author abstract)

32868 **APTIC NO. 54300**

Shtutman, Ts. M. and R. V. Chagovets

METABOLIC RELATIONSHIPS BETWEEN VITAMIN E, SELENIUM AND AMINO ACIDS CONTAINING SULFUR (REVIEW OF THE LITERATURE). *(Obmennye svyazi mezhdu vitaminon E, selenom i serusoderzhashchimi aminokisoltami (obzor literatury)). Vop. Pitan., vol. 30:13-20, Sept.-Oct. 1971. 62 refs. Translated from Russian, 19p.*

Selenium toxicosis in rats is discussed in a review of the metabolic relationships between vitamin E, selenium, and amino acids containing sulfur. One of the reasons for Se toxicosis is a disturbance in the synthesis of protein as a result of methionine inadequacy. The effectiveness of using methionine with vitamin E for limiting the development of toxicosis and decreasing the methionine content in the case of chronic selenosis and the dependence of the degree of development of toxicosis on the protein content in the diet confirm this. The content of free amino acids in the liver of rats was studied to determine the maximum dose of administered Se still not causing appreciable impairments in the metabolism. The tissue content of glutamine is characterized by a special lability; the content is reduced sharply during the first 2 hr after administering considerable quantities of selenite. The minimum dose still not causing a decrease in the glutamine concentration was 75 micrograms of sodium selenite per 100 g of animal weight. With the administration of 30 micrograms of Se per 100 g of weight, the incorporation of methionine-S in the glutathione of rat liver is increased by a factor of 2.5. With a doubling of this dose the radioactivity of glutathione is increased by a factor of five, but its higher doses exerted a lesser effect. Selenite obviously activates transformation of tissue methionine into cystein and the utilization of the latter for glutathione formation.

32869 **APTIC NO. 54728**

Strehlow, Clifford David

THE USE OF DECIDUOUS TEETH AS INDICATORS OF LEAD EXPOSURE. *New York Univ., N. Y., School of Engineering and Science, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Dec. 1971, 160p. 74 refs.*

In order to evaluate the usefulness of deciduous teeth as indicators of lead exposure, a study was undertaken to follow a single dose of lead with time as it is affected by active skeletal and dental metabolism in growing animals. Eight immature baboons were given single intravenous doses of lead(210), periodically had deciduous incisors extracted, and were serially sacrificed from one month to 15 months after exposure. The rapid clearance of lead from the blood indicates that blood lead determinations are of little value in determining past exposure to lead. Major sites of soft tissue uptake were the liver, kidney, and brain. The immature baboon had a greater uptake of lead by the brain than the adult baboon. Tooth lead concentrations following the single dose did not change with time. Shed teeth lost only the lead deposited in the root. For fully formed teeth, roots exhibited a higher uptake than the crowns, and the variation in whole tooth concentrations for a given baboon was directly related to the proportion of crown and root. Chelation with BAL and EDTA one year after the dose did not remove lead from the teeth. The preferential uptake by the roots and by unerupted teeth suggests that multiple tooth analyses would be necessary to assess the exposure for sporadic lead insult. Thus, baby teeth could be used to analyze lead exposure in children. (Author abstract modified)

1970

32870 **APTIC NO. 55073**

De Rosa, E. and F. Gobbato

NON-PROFESSIONAL SATURNISM: A POLLUTION EPIDEMIC FROM INDUSTRIAL EMISSION. *(Epidemia di saturnismo non professionale per inquinamento da effluenti industriali). Igiene Mod. (Parma), 63(1/10):472-484, 1970. Translated from Italian.*

An epidemic of lead poisoning occurred among residents of a small Italian community, Stanghella, in the proximity of a plant for the fusion of lead from used automobile batteries. Of the 170 persons examined, 30.7% had urinary lead levels between 30-60 micrograms/l and 37.2% had significantly high levels. Such levels are not generally encountered in individuals with occupational exposure to lead. High values of erythrocytic protoporphyrins proved the existence of very high lead concentrations in the tissues of about two-thirds of the population. Only one-third of the cases showed a definite increase in urinary coproporphyrins; however, the majority of the subjects were examined 3 months after the plant was closed and urinary coproporphyrins are known to decrease rapidly following cessation of lead exposure. Pronounced iron anemia was registered in 12 cases. Most subjects lived 300-700 ft downwind from the plant, suggesting that the lead poisoning was brought about by direct contamination of their houses and front yard vegetable gardens.

32871 **APTIC NO. 54732**

Maltoni, G. and D. Carretti

EXOGENIC ENVIRONMENTAL AND OCCUPATIONAL SUBSTANCES CAUSING CANCER IN THE HUMAN LUNG. PREVENTIVE MEASURES. *(Gli agenti oncogeni esogeni (ambientali e professionali) per il polmone nell uomo. Misure di prevenzione). Text in Italian. Bull. Sci. Med., 142(4):311-321, 1970. 101 refs.*

The enormous increase in the incidence of lung cancer testifies to the growing diffusion of oncogenic agents in the environment. An agent is considered oncogenic on the basis of epidemiological data, the circumstance that it causes cancer in other organs besides the lungs reinforces the validity of such designation. Potentially oncogenic are agents to which humans are exposed which, when inspired, cause cancer in the lungs of animals. This latter classification applies to isonicotinic acid hydrazide, to nitrosamine, to nitrocholine and related compounds, to carbamates, to halogenated hydrocarbons, and natural and synthetic polymers. Important for primary prevention of cancer by agents in the environment are biological tests of new substances for oncogenicity in animals, epidemiological studies even where experimental tests have yielded negative results, legislation prohibiting the manufacture and distribution of cancer-causing agents, technical and hygienic measures in the case of occupational exposure to such agents, and public education conducted through the media, the press, and the schools.

1967

32872 **APTIC NO. 55052**

Bellare, Ramesh Appu

STUDIES IN MANGANESE POISONING. *Univ. Bombay (India), Faculty of Sciences, Thesis (Ph.D.), Jan. 1967, 139p. 289 refs.*

The manganese concentrations in the body fluids and excreta of healthy unexposed persons, persons exposed to manganese, and chronic manganese poisoning cases were compared. There was no significant difference in the levels of Mn in the urine, feces, or cerebrospinal fluid of chronic Mn poisoning patients and unexposed persons, while the Mn level in the serum of the unexposed persons was more than twice that in the serum of the chronic poisoning cases; the latter difference was highly significant. The oral administration of calcium disodium ethylenediamine tetraacetate (CaNa2EDTA), a drug which helps in the elimination of Mn from the body, did not significantly change the manganese levels in the excreta or cerebrospinal fluid. However, the serum Mn concentrations in the chronic poisoning patients rose significantly on the third day of drug treatment. The data indicated that the concentration of Mn in the hair can serve as a very sensitive indicator of exposure to this element; the concentrations are lower in persons exposed to Mn. While the hair Mn concentration does not necessarily indicate Mn poisoning, it does indicate the degree of exposure. There is indication that the prophylactic use of CaNa2EDTA is justifiable. (Author summary modified)

1965

32873 **APTIC NO. 54699**

Sachsenmaier, Wilhelm, Wilhelmine Siebs, and Tjong-An Tan

EFFECTS OF OZONE UPON MOUSE ASCITES TUMOR CELLS AND UPON CHICK FIBROBLASTS IN TISSUE CULTURE. *(Wirking von Ozon auf Maeuseascitestumorzellen und auf Huehnerfibroblasten in der Gewebekultur). Text in German. Z. Krebsforsch., 67:113-126, 1965. 44 refs.*

Mouse ascites tumor cells were treated with ozone in vitro and the effects on viability, respiration, glycolysis, and on the ultraviolet absorption of the cell suspensions were studied. The results indicate a preferential action of O3 upon the cell membrane. This was shown by a marked increase in the ultraviolet absorption in cell suspensions after O3 treatment. This increase reflected physical changes resulting from the leakage of ultraviolet absorbing material into the medium. Respiration and glycolotic activity fell to zero after a few minutes of treatment with 5% O3. Tumor inducing capacity, however, was destroyed only after 20 min of O3 treatment. Glycolytic activity was affected more than oxygen uptake, particularly in experiments with low doses of O3. Tissue cultures of embryonic chick fibroblasts exhibited strong, but mainly unspecific alterations of both interphase and miotic cells after 30 min exposure to 1-10 gamma/ml gaseous O3. These abnormal cells were detected only at the margin of the cultures and in the top layer of the middle piece, indicating little penetration by O3. Several hours after exposure to O3, abnormally reconstructed cells were present with one, two, or more nuclei. They apparently were derived from arrested or retarded miotic cells. A small number of cells were found with chromosome bridges in anaphase and telophase, along with nuclear fragments resembling cells with x-ray induced chromosome aberrations. (Author abstract modified)

1963

32874 **APTIC NO. 54271**

Schoettlin, Charles Earl

THE HEALTH EFFECT OF AIR POLLUTION ON ELDERLY MALES. *California Univ., Los Angeles, Calif., Dept. of Public Health Sciences, Thesis (Ph.D.), Univ. Microfilms, Inc., Ann Arbor, Mich., Jan. 1963, 80p. 16 refs.*

The long-term and acute effects of polluted air on a population of elderly males in Los Angeles, California were studied. The following were investigated in the study: prevalence of chronic respiratory disease in relationship to occupation, smoking, and residence, and the effect of daily changes in environment on the health status of men having chronic respiratory disease. The population studied including 3000 residents of the Veterans Administration Domiciliary and chronic disease hospital. Each member was examined to determine the presence or absence of symptoms and signs of chronic respiratory disease, to elicit occupational, smoking, and residential histories, and to obtain a measure of pulmonary function. Data obtained were coded for analysis utilizing IBM data processing equipment. Occupational categories showing significantly higher prevalence of the criteria of chronic respiratory disease included cooking fats, gasoline and oils, coal dust, road dust, and welding fumes. Smoking more than 10 years showed a similar increased prevalence. Residence in the North Central United States, South Central United States, and California also were associated with an increased prevalence of clinical criteria of chronic respiratory disease. No positive association was found between size of community of residence and the clinical criteria. The Puff-meter, a pulmonary function testing device, was field tested and valuated on the basis of data obtained. Samples of the population with chronic respiratory disease, and controls matched on age and smoking history, were observed weekly in a medical clinic to define the current respiratory status of each group. Symptoms, physical signs, Puff-meter reading one-second forced expiratory volume, and total vital capacity were observed. Several measures of weather, air pollution, and pollen were made concurrently. Multiple regression analysis did not reveal significant correlations between measures of temperature, relative humidity, weather, oxidants, sulfur dioxide, nitrogen oxides, smog plant damage, visibility, or pollen count and observations of symptoms, physical signs, or pulmonary function. (Author abstract modified)

1962

32875 **APTIC NO. 55001**

Schulte, John Hiller

EFFECTS OF MILD CARBOXYHEMOGLOBINEMIA IN HUMAN SUBJECTS. *Cincinnati Univ., Ohio, Div. of Industrial Medicine, Thesis (Ph.D.) 41p., 1962. 40 refs.*

The effects of exposure for varying lengths of time to an atmosphere containing 100 ppm carbon monoxide were measured in 49 healthy men, aged 25-55 yr. This exposure produced blood carboxyhemoglobin levels ranging from 0-20.4%. Impairment of function due to CO exposure occurred earliest in the higher centers of the central nervous system in the area of the brain controlling some of the cognitive and psychomotor abilities. Impairment of relatively simple cognitive abilities and choice discrimination was detectable at COHb levels below 5%, the degree of impairment increasing with increasing COHb concentration. It is highly possible that more complex psychological functions involved in making judgements, correct decisions, and rapid responses are also impaired by low COHb levels. The maximum allowable CO concentration in certain working environments should be reduced. The absence of subjective symptoms or alterations in physiological signs in the test group indicates a need for psychological testing in toxicological research laboratories. (Author summary modified)

1952

32876 **APTIC NO. 54306**

Baader, E. W.

CHLORINE ANHYDRIDE POISONING (THE WALSUM DISASTER). *(Intoxication por Anhidrido de Cloro (La Catastrofe de Walsum)). Med. Deporte Trab., vol. 17:5252, 5254, 5256, 5258-5259, 1952. Translated from Spanish, 8p.*

Chlorine poisoning that occurred because of the explosion of 17 tons of liquid chlorine in Walsum (Rhine) is discussed. The steel cylinder exploded on April 4, 1952 for unknown reasons and poisoned 240 people. Fifty poisonings were serious and eight were fatal. Unusual symptoms for chlorine poisoning included 12 cases of diarrhea and one case of glucosuria. The autopsies on three cadavers showed small layers of red blood corpuscles in different parts of the white matter of the brain, and of the cerebellum, near blood vessels. Macroscopically, they were visible as hemorrhagic points. Microscopically, they were fresh, perivascular hemorrhages in layers without reaction. Neither the brain nor other parts of the body smelled of chlorine, but there was a dryness in the mouth and throat. The medical examination of the lungs of the three cadavers revealed differences. Patient one had pulmonary edema and several hemorrhagic foci in the upper lobes. Patient two had a typical pulmonary edema in the upper and lower lobes. Patient three had a chronic pulmonary stasis and an advanced pulmonary enphysema, with air bubbles the size of small apples, but no pulmonary edema. This is the first report of cerebral hemorrhages in the case of chlorine poisoning.

EFFECTS-PLANTS AND LIVESTOCK

1973

32877 **APTIC NO. 54430**

Dunning, John A. and Walter W. Heck

RESPONSE OF PINTO BEAN AND TOBACCO TO OZONE AS CONDITIONED BY LIGHT INTENSITY AND/OR HUMIDITY. *Environ. Sci. Technol., 7(9):824-826, Sept. 1973. 11 refs.*

The interaction of relative humidity and light intensity was investigated during a preexposure growth period and an exposure period on the foliar sensitivity of pinto bean and Bel W3 tobacco. Their reaction to ozone stress under varied conditions was also determined. The two species were grown and exposed for 1 hr to 40 pphm of O3 at two light intensities and at two relative humidities. Foliar injury to pinto beans varied from 20-92% and to tobacco plants from 20-47% under the 16 different combinations of preexposure growth and exposure conditions used. Foliar injury showed a significant species by preexposure growth humidity by preexposure growth light interaction. Light intensity and relative humidity prior to exposure significantly affected the response of both species to O3. Pinto bean showed a significant response to both light and relative humidity during exposure, but tobacco did not. The interaction between relative humidity and light intensity during exposure was significant, independent of species. (Author abstract modified)

32878 **APTIC NO. 54713**

Gehu, Jean-Marie, Marcel Bon, Chantal Delzenne, and Francis Rose

CARTOGRAPHY OF ACID ATMOSPHERIC POLLUTION IN NORTH OF FRANCE IN RELATION TO TOXISENSITIVITY OF EPIPHYTIC LICHENS. *(Essai de cartographie de la pollution atmospherique acide dans le Nord de la France en relation avec la toxisensibilite des lichens epiphytes). Text in French. C.R. Acad. Sci. Paris, Ser. D., 276(5):729-732, Jan. 1973.*

The Nord, Pas-de-Calais, and Somme areas of France were divided into ten different zones of sulfur dioxide pollution on the basis of the Hawksworth-Rose toxisensitivity scale established for epithytic lichens. Some 600 sites were chosen for the cartographic study. Progressive pollution gradient from the West to the East with major industrial and mining activity was observed. The site of the pollution peak was shifted as a function of the dominant wind direction. Pollution cartography by means of epiphytic lichens has the advantages over physiocochemical techniques of being more simple, flexible, and economical.

32879 **APTIC NO. 54755**

Houten, J. G. ten

BIOLOGICAL ASPECTS OF AIR POLLUTION. *(Biologische aspecten van de luchtverontreiniging) Text in Dutch. Chem. Weekblad, 69(26):11-12, June 1973. 11 refs.*

Studies on the effects of air pollutants, such as automotive exhaust components, sulfur dioxide, hydrofluoric acid, and ozone, on plants, animals, and humans are reviewed. Very high susceptibility of spinach and lettuce to ozone and peroxyacetyl nitrate was observed. Nitrogen oxides cause leaf burns in certain plants, while nitrogen dioxide interferes with growth processes in tomatoes in concentrations as low as 0.25 ppm. Ethylene in above-normal concentrations has similar effect on tomatoes. Necrosis of leaf tissues due to the action of SO2 was observed. The acidification of the soil and of surface water bodies, a process most acute in Sweden due to SO2, interferes with the lives of certain plant and animal species. Lichens were determined to be most sensitive to SO2 of all plants. Leaf burns and inhibition of the cis-aconitase in Fresia and Gladiolus species due to hydrofluoric acid was evidenced. This pollutant also tends to reduce bee populations in polluted areas.

32880 **APTIC NO. 54394**

Huckabee, John W.

MOSSES: SENSITIVE INDICATORS OF AIRBORNE MERCURY POLLUTION. *Atmos. Environ., 7(7):749-754, July 1973. 13 refs.*

Samples of fly ash, mosses, and other vegetation were collected at varying distances from fly ash sources and analyzed for mercury content in order to determine the applicability of mosses as sensitive monitors of airborne mercury pollution. Fly ash exposed to rain water collected 2 km from a power plant smokestack had a mean Hg concentration of 0.98 ppm. Based on this value and the annual rate of dry fall, input to the area was calculated to be 20-30 micrograms Hg m to the -2 power y to the -1 power. Mosses had significantly higher Hg concentrations than the other plants collected at the same location, usually by an order of magnitude. The Hg content of mosses app red to be a function of the distance from smokestack anging from 1.13 ppm in polluted areas to 0.066 ppm in rem areas (mean values). Experiments with radioactive Hg tag fly ash showed that mosses take up and retain Hg to a gre r extent than grasses do. (Author abstract)

32881 **APTIC NO. 54573**

Lee, J. A. and J. H. Tallis

REGIONAL AND HISTORICAL ASPECTS OF LEAD POLLUTION IN BRITAIN. *Nature (London), 245(5422):216-218, Sept. 28, 1973. 12 refs.*

Two major periods of increase in atmospheric lead concentrations have been recognized in the Northern Hemisphere: the first resulting from the rapid growth of industry during the two previous centuries; and the second resulting from the expansion of motor vehicle traffic since the end of the Second World War. Historical trends in lead pollution in Britain were examined by use of nineteenth century and present day moss specimens and by peat profiles. The moss specimens showed clear regional differences in lead concentrations, the lowest concentrations being recorded for samples from oceanic areas remote from large population centers,and the highest being for samples from the old lead mining and smelting areas of Teesdale and the White Peak of Derbyshire. In none of the regions studied was there any significant increase in the lead content of the present day samples. A peat profile from Snake Pass in Derbyshire showed major lead pollution which correlated well with the industrialization of the surrounding area and the rise of the Derbyshire lead industry. A Buxton, Derbyshire peat profile showed a similar increase in lead pollution paralleling the growth of the lead industry in that region. Samples from northern Scotland, a region of low background pollution, showed that the exhaust from motor vehicles had had little effect on the lead concentrations in vegetation away from busy roads. Thus, the overall regional pattern of lead pollution has been little affected by automobiles.

32882 **APTIC NO. 54871**

Pyatt, F. Brian

PLANT SULPHUR CONTENT AS AN AIR POLLUTION GAUGE IN THE VICINITY OF A STEELWORKS. *Environ. Pollut., 5(2):103-115, Sept. 1973. 19 refs.*

The development of industrialization in the important steel-producing town of Port Talbot, South Wales, is discussed. The atmospheric concentrations of sulfur dioxide in this region are surprisingly low, although high concentrations are encountered at some locations (e.g., around blast furnaces) and the concentrations of SO2 and smoke vary seasonally. Sulfur dioxide is taken into plants via adsorption in rain and dew, and via gaseous assimilation, mainly through stomata. Responses to SO2 pollution vary from species to species, with atmospheric relative humidity strongly affecting plant susceptibility to the pollutant. Sulfur dioxide produces changes in the stomata, swelling of the thylakoids within the chloroplasts of beans, and necrosis of the terminal portion of the leaf blade. The sulfur content of lichens from the Port Talbot region was measured and compared with the of plants from other regions. Plants from polluted area generally had higher sulfur contents than plants from relatively nonpolluted areas. THe relationship is not, however, straightforward, but is affected by factors such as the absorption of gaseous pollutants by surrounding vegetation and degree of exposure. The plant sulfur content generally decreased with increasing distance from the pollution source, but local anomalies occurred. The following species were considered in some detail: Peteridium aquilinum; Quercus petraea; and Acer pseudoplatanus. (Author abstract modified)

32883 **APTIC NO. 54182**

Tatsumi, Shuzo

HEAVY METALS AND TREES. *(Jukinzoku to jumoku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(9):881-892, Sept. 1973.*

Trees near streets, in parks, and in mountainous areas of Kitakyshu, Kobe, and Takamatsu cities were analyzed for metal compounds. Atomic absorption spectrophotometry was used to determine lead, zinc, copper, cadmium, manganese, and iron. Lead pollution was higher in Kobe and in the Wakamatsu area of Kitakyushu than in other areas. Zinc concentrations were highest in Kobe and were lowest in Takamatsu. Copper and cadmium concentrations were higher in large cities, and iron concentrations were generally higher in large cities. Lead pollution due to automobile exhausts proceeded at the same extent regardless of city size.

32884 **APTIC NO. 55282**

Treshow, Michael and Dennis Stewart

OZONE SENSITIVITY OF PLANTS IN NATURAL COMMUNITIES. *Biol. Conserv., 5(3):209-214, July 1973. 10 refs.*

Field fumigation studies with portable fumigation chambers conducted in grassland, oak, aspen, and conifer communities established the injury threshold of prevalent plant species to ozone. Several important species, including Bromus techtorum, Quercum gambelii, and Populus tremuloides, were injured by a single 2-hour exposure to 15 pphm O3. Over half the perennial forbs and woody species studied were visibly injured at concentrations of 30 pphm O3 or less. It is postulated that lower concentrations at prolonged or repeated exposures to O3 may impair growth and affect community vigor and stability. Continued exposure of natural plant communities to O3 is expected to initiate major shifts in the plant composition of communities. (Author abstract)

32885 **APTIC NO. 54597**

Yamatomo, Takeo

POLLUTION AND ITS CIRCUMFERENCE (IV): BIOLOGICAL USE AND ENVIRONMENTAL INVESTIGATION. *(Kogai to sono shugen 4, Seibutsu riyo to kankyo chosa). Text in Japanese. Kagaku to Yakugaku no Kyoshitsu (Chem. Pharm., Quart. J.), no. 40:6-11, 1973. 5 refs.*

For measurement of traceable sulfur oxide, the use of microbiological quantitation of sulfate ions is reliable and convenient for treating a large amount of test material simultaneously. This method is also useful for examining bacterial proliferation inhibitors or inhibiting factors. Quantitation of sulfates in rain water by the colitis bacteria (Escherichia coli), and the relationship between inhibitors and toxic metals are discussed. The pattern of hydrogen fluoride damages was examined by gladioli and orange leaf experiments. The SOx first damages the plant s spongy parenchyma and then the total system. The damages appear first in spots, and then turn into gray, white or yellow as the symptom advances. The HF can be absorbed in gas form through the stomata of the epidermis and damage spongy parenchyma and palisade, or water soluble compounds in HF can be absorbed into plant. Once absorbed, HF moves to the tips or edges of the leaves, and the accumulation causes graying or browning of the leaves. Traceable amounts of HF can damage agricultural produce visibly In the area 1-2 km from the emission source, plants can have approximately 150 ppm, or five times the HF accumulation in a control area. Rats were raised at a street intersection to see the effects of automotive exhaust gas. An interesting and significant inhibition of weight increase was noted among one group of rats. The lead content in the atmosphere or the dust count did not show a significant difference from other exposure areas. In addition to exhaust gases, noise, light, and other conditions such as ventilation, temperature, and vibration seemed to have inhibited the growth of the rats.

32886 **APTIC NO. 55270**

Yannai, S. and A. Haas

OCCURRENCE OF LEAD IN SESAME PASTE AND FACTORS RESPONSIBLE FOR IT. *Cereal Chem., 50(5):613-616, Sept.-Oct. 1973. 11 refs.*

Sesame paste contains a relatively high concentration of lead, approximately 2.2 ppm. Sesame paste was stored in unlacquered cans and high density polyethylene jars, and sesame seeds of different origins were purchased from the same factory and sampled at random. Some of the cans, each containing 100 g paste, were stored at 35 C for 2 mo to determine evidence of accelerated corrosion and/or migration of the lead from the solder in the side seams of the cans. However, there was no increase in the initial level for any of the samples. The high concentration is not due to migration of the metal present in the packaging material, but rather to an original high content in the oilseeds, as found in samples from three countries. This conclusion is particularly crucial for certain populations in the Orient and Africa for whom sesame paste is a staple food. The maximum acceptable load of lead from food set by FAO/WHO Expert Committee on Food Additives is 0.005 mg/kg body weight per day. Thus, the consumption limit of foods containing more than 2 ppm of lead is below 175 g/day for an adult weighing 70 kg. Lead contamination of crops can be caused by aerial fallout from pesticide, industrial, or automotive sources of lead.

1972

32887 **APTIC NO. 54406**

Davis, Charles R.

SULFUR DIOXIDE FUMIGATION OF SOYBEANS: EFFECT ON YIELD. *J. Air Pollution Control Assoc., 22(12):964-966, Dec. 1972. 8 refs.*

The influence of sulfur dioxide fumigation of soybean plants on yield was determined by a 3-year experiment on 485 plots of soybeans. Single fumigations of SO2 with concentrations varying from 0.5 ppm to 6 ppm were applied to 10 different stages of growth in 1968-1969 and seven stages of growth in 1970. A linear relationship existed between the percent of leaf area destroyed and the percent crop loss, with a significant regression coefficient of b equals 0.659, or 2/3 of 1% crop loss for each percent of area destroyed. No definite significant stage of growth effect was found and no treatment effects were significant for the early stages of growth from the three leaf to the 15 leaf stage, nor was there any loss in yield without visible leaf injury. (Author abstract modified)

32888 **APTIC NO. 54920**

Ishikawa, Haruhiko

THE EFFECTS OF AIR POLLUTANTS ON PLANTS. *(Taiki osen busshitsu ga shokubutsu ni oyobosu eikyo). Text in Japanese. Denryoku Chuo Kenkyusho-ho (Rept. Central Res. Inst. Elec. Power Ind.), no. 21:6-10, 1972.*

Various factors for the appearance of plant damages by sulfur dioxide were studied by grape leaf experiments. When a continuous exposure and a sporadic exposure were compared, the sporadic method of exposure caused remarkably less damage. For instance, when exposed to 0.26 ppm of SO2 continuously, the grape leaves showed the damage in 24 hours; but when they were exposed only during the day, damages appeared only after 14 days. The stage of growth and season have an important relationship with the damages by air pollutant. The perennials such as fruit trees are easily damaged between summer and fall, and most resistant in winter. The SO2 absorption by plants during the day is about twice as much as that during the night, and plants are more easily damaged by the daytime exposure to SO2. When the plant is healthy and is in good condition, air pollution damages can be avoided to a certain extent. The amount of fertilizer and plant care can also contribute. With regard to meteorological conditions, strong sunshine, high temperature, or humidity damage plants easily. Reddish lights damage plants more than bluish lights. Generally, damages do not appear on cloudy or rainy days, but mostly appear early hours of morning on sunny days. When humidity is high and the sunshine suddenly increases after the rain, plants are more susceptible to air pollutants. When pesticides and SO2 multiply their reactions, fruit trees and small plants can be damaged by free copper ions, especially when the weather is wet.

32889 **APTIC NO. 54297**

Knabe, W.

POLLUTION AND ITS THREAT TO FORESTS IN THE RUHR. *(Immissionsbelastung und immissionsgefaehrdung der Waelder im ruhrgebiet). Mitt. Forst. Bundesuers., no. 97/I:53-87, 1972. 30 refs. Translated from German, 36p. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 1970.)*

The effects of air pollution on the forests in the industrial areas of the Ruhr district are discussed. No older spruce and pine stands of yield classes I-V are found in the center of the Ruhr district. The remaining stands are characterized by a lower needle age, sparse crowns, reduced growth in height and diameter, as well as increased amounts of dead wood resulting from the additional action of secondary parasites. Concentrations of sulfur, fluoride, chloride, and lead are found in needles and leaves. Acute damage to broadleaved species is concentrated in the vicinity of certain industrial plants which emit fluorine and chlorine compounds. The causes of chronic pollution damage are primarily sulfur dioxide, halogen compounds, oxidizing agents, and dusts. The extent to which heavy metals are causes for damage has not been determined. The danger of pollution to conifers is estimated in North Rhine-Westphalia in part of the basis of the SO2 measuring program, with SO2 being considered to be both a harmful substance and an indicator for general air pollution. The risks of cultivating conifers is estimated in part according to the frequency with which certain mean values for the growth season are exceeded. In the central area, the growth season mean value of 0.08 mg SO2/cu m was as a rule exceeded in at least 3 of 4 years, in the border area it was reached or exceeded as a rule at least in 1 year. (Author summary modified)

32890 **APTIC NO. 54711**

Macris, Basil J.

TRANSPORT AND TOXICITY OF SULFUR DIOXIDE IN THE YEAST SACCHAROMYCES CEREVISIAE VAR. ELLIPSOIDEUS. *Michigan State Univ., Dept. of Food Science and Human Nutrition, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 104p. 72 refs.*

Investigations conducted on the transport and toxicity of sulfur dioxide in the yeast S. cerevisiae var. ellopsoideus revealed a mediated transport system for SO2 and a cell growth suppression dependency upon the amount of molecular SO2 and the time period of contact with the cell. MOlecular SO2 was the only form transported; bisulfite and sulfite ions were not taken up by the yeast. Not all of the transported SO2 was retained within the cell, and a certain portion of it could be removed by washing. The amount of SO2 taken up was increased as the pH value of the incubation mixture was decreased. The transport system operated very rapidly, and SO2 reached its maximum level in about 2 min. Two equilibria were involved in the transport; the first, a chemical equilibrium, regulated the availability of substrate (molecular SO2) to the transport; and the second regulated the inward and outward fluxes of SO2 across the cell membrane. Kinetic data showed that the transport was saturable, and the system was temperature dependent and irreversibly heat inactivated. The relationship of cell viability and time to SO2 exposure was linear on a semilog plot. Preliminary study of the localization of 35S in cells exposed to 35SO2 showed that SO2 was not actively metabolized, and practically all the SO2 which reacted within the cell was found in the small molecule fraction. Sulfur dioxide most likely reacts with compounds containing carbonyl groups as well as with other molecules inhibiting various steps which cause termination of cell growth. (Author abstract modified)

32891 **APTIC NO. 54910**

Matsushima, Jiro and R. F. Brewer

INFLUENCE OF SULFUR DIOXIDE AND HYDROGEN FLUORIDE AS A MIX OR RECIPROCAL EXPOSURE ON CITRUS GROWTH AND DEVELOPMENT. *J. Air Pollution Control Assoc., 22(9):710-713, Sept. 1972. 13 refs.*

The influence of exposure to mixtures of sulfur dioxide and hydrogen fluoride on Koethen sweet orange, and alternate exposure to these gases on Satsuma mandarin, were tested using a rotating fumigation greenhouse. The concentration of SO2 was effectively maintained at approximately 0.8 ppm or 2.3 mg/cu m during the experiment, but the HF concentration varied from approximately 2.5 ppb or 2.2 micrograms/cu m at the beginning of the experiment to approximately 13 ppb (11.6 micrograms/cu m) at the end. Effects of HF-SO2 mixtures on linear growth and leaf area of Koethan orange were additive, not synergistic. No necrosis was observed on Koethen oranges exposed to HF, SO2, or a mixture of HF and SO2. Effects of the mixture on chlorosis of Satsuma mandarin foliage was also not synergistic. No significant difference in linear growth of Satsuma mandarin was found. Alternate exposure to SO2 followed by HF produced no synergistic injury to Satsuma mandarin. Satsuma mandarin appeared more sensitive than Koethen orange to HF, SO2, and mixtures of these two gases, using degree of chlorosis and leaf abscission as the criteria of sensitivity. If linear growth and leaf area were the principal criteria considered, Koethen orange would appear more sensitive. (Author abstract modified)

32892 **APTIC NO. 55297**

Sawamura, Shogo and Shizuko Kobori

EFFECTS OF SULFUROUS ACID GASES ON PLANT CELLS IN VIVO (I). *(Aryusan gasu no seitai shokubutsu saibo ni oyobosu sayo (I). Text in Japanese. Utsunomiya Daigaku Kyoikugakubu Kiyo (Dainibu) (Bull. Utsunomiya Univ. (Sect. 2)), no. 22:31-36, 1972. 8 refs.*

The acute effect of sulfur dioxide on plant cells was studied using Commelina communis leaves. An excised segment of Commelina epidermis, treated with an agar plate containing 2 or 4% sucrose, was cultured in a moist chamber on the first day of the experiment. On the second day, the agar layer on the cover glass was stripped and the middle part of the tissue segment remaining on the glass was exposed to the rapid flow of SO2 for 5 sec. Exposed cell groups showed hard alterations of protoplasm and its severe coagulation. In the cell death of the outermost part, granules and crystals exhibited Brownian movement in the protoplasm converted to liquid. After treatment with the gas, some cells showing slow protoplasmic streaming in normal living cells were dead within 3 days. The liquefaction of protoplasm and the weakness of cells may be connected with the chronic toxicant action of SO2. Related experiments with leaves of Tradescantia, Begonia Evansiana, and Saxifraga stlonifera are described.

32893 **APTIC NO. 54649**

Stephens, George R., Lester Hankin, and William D. Glover, Jr.

NOTE ON LEAD EMISSIONS FROM INCINERATED SEWAGE SLUDGE DETECTED ON TREE FOLIAGE. *J. Air Pollution Control Assoc., 22(10):799-800, Oct. 1972. 11 refs.*

Lead emissions from incinerated sewage sludge were detected on tree foliage. Foliage of trees growing at varying distances and directions from incinerator stacks of two facilities was sampled. Foliage was also sampled along the highway about 2 mi from Facility 1 because it was within 20 yd of a highway. The average daily loss of Pb at Facility 1 was 0.7 lbs; losses ranged from 0 to 1.4 lbs. At Facility 2 only 0.26 lbs of Pb was lost. In all of the foliage analyzed Pb was present in large quantities only in the vicinity of Facility 1. The quantity of Pb on foliage near Facility 1 varied with distance and direction from the incinerator stack and the highway. The Pb content of the samples averaged 69% higher than the samples taken 2 mi north of the incinerator. The Pb content of tree foliage surrounding Facility 2 was about half that found along the highway north of Facility 1 and about a third of that found on trees around Facility 1.

32894 **APTIC NO. 54710**

Weinstein, Leonard H., Jay S. Jacobson, and Richard H. Mandl

FLUORINE--SEMIAUTOMATED METHOD. *J. Assoc. Offic. Anal. Chemists, 55(5):998-1003, Sept. 1972.*

A semiautomated, colorimetric method for the analysis of fluoride in vegetation is presented. Dried and ground plant material is ashed, fused with alkali, and diluted to volume. Leaf samples may be washed with an aqueous solution containing 0.05% detergent and 0.05% tetrasodium ethylene diamine tetracetic acid salt. The digest and sulfuric acid are then pumped into microdistillation apparatus which is maintained at 170 C. A stream of air carries the acidified sample to a fractionation column where F and water are distilled into a condenser; the condensate passes into a small collector. The distillate is mixed continuously with alizarin F blue-lanthanum reagent, the colored stream passed through a tubular flowcell of the colorimeter, and the absorbance measured at 624 nm. Conditions must be carefully controlled since accurate results depend upon obtaining the same degree of efficiency of distillation from samples as from standard F solutions used in calibration. The temperature must be maintained within plus or minus 2 C, and regulation of the acid concentration during distillation is achieved by taking plant samples in the 0.1-2.0 g range and by using specified amounts of calcium oxide and sodium hydroxide for ashing and fusion. Interfering metal cations and inorganic phosphate are not distilled, and organic substances are destroyed by ashing. Interference from remaining volatile inorganic anions is reduced with high concentrations of acetate buffer at the expense of some reduction in sensitivity. The method can detect 0.1 micrograms F/ml, and the normal range is 0.1-4.0 micrograms F/ml.

1971

32895 **APTIC NO. 55012**

Grosso, J. J., H. A. Menser, G. H. Hodges, and H. H. McKinney

EFFECTS OF AIR POLLUTANTS ON NICOTINA CULTIVARS AND SPECIES USED FOR VIRUS STUDIES. *Phytopathology, vol. 61:945-950, Aug. 1971. 17 refs.*

Three tobacco cultivars (Nicotiana tabacum) and two Nicotiana species, used for virus identification studies, were tested for susceptibility to air pollutants. The air pollutants used were ozone; sulfur dioxide; and a mixture of both gases. Nicotiana rustica var. brasilia was the most susceptible cultivar to injury from individual gases, a gas mixture, and amibient polluted air. Nicotiana rustica var. brasilia displayed from 25 to 70% leaf injury when exposed to increasing ozone doses (10 to 30 pphm). Ozone injury to N. glutinosa fumigated at the same doses ranged from 10 to 60%. Samsun, Samsun (NN), and Xanthi cultivars were more resistant to ozone than N. rustica var. brasilia or N. glutinosa. Sulfur dioxide (ca. 45 pphm) added to an ozone (ca. 3.0 pphm) atmosphere induced a synergistic response evidenced as injury to all cultivars and species. Mixed gas injury was more acute on N. glutinosa and N. rustica var. brasilia than on Samsun, Samsun (NN), and Xanthi. Samsun and Samsun (NN) were more susceptible to sulfur dioxide (125 pphm) than N. glutinosa and Xanthi Fumigations produced two injury syndromes: light or dark punctate flecks, on upper leaf surfaces; or bifacial tissue collapse. (Author abstract)

32896 **APTIC NO. 55100**

Jenkins, Dale W.

GLOBAL BIOLOGICAL MONITORING. *In: Man s Impact on Terrestrial and Oceanic Ecosystems. William Henry Matthews (comp.), Cambridge, Mass., MIT Press, 1971, Chapt. 22, p. 351-370.*

Three methods of study are required to survey and monitor the conditions of the plants and animals of the world. These are international networks using: biological organisms; biological censuses and surveys; and ecological base-line monitoring stations. Biological monitors can be plant, animal, and/or human, and consist of the following types; sentinels, which are highly sensitive organisms serving as early warning devices of dangerous situations; bioassay monitors, which are used as bioreagents to detect or monitor the presence and/or concentration of pollutants; detectors, which are individual species showing a measurable response to pollutants or environmental changes; indicators, which are specific organisms whose presence indicates the probability of pollution or dangerous organisms associated with pollution; and accumulators, which absorb and accumulate a pollutant in measurable quantities. Biological surveys are broad geographic surveys of the population size, reproductive success, and health of species of living organisms, particularly those high in the trophic or food chain levels. Surveys of plants should also be carried out on a broad scale. Ecological base-line monitoring stations should be established to show general changes of major significance to the flora and fauna of the world. These stations should be located in representative biome regions on land and in estuaries and the ocean. In addition to biological monitoring, they should be designed to monitor general changes in climate and the presence of various man-induced contaminants and pollutants. The major environmental parameters of global importance which should be monitored are hydrocarbons, of which the most important are DDT and the aldrin-group pesticides, and toxic metals.

32897 **APTIC NO. 55117**

MacDonald, D. W., M. A. Lamoureux, M. Van den Brink, G. R. Whenham, and W. P. Brisbane

CHLORINE GAS POISONING IN FARM LIVESTOCK: CASE REPORT AND REVIEW. *Can. Vet. J., 12(2):33-40, Feb. 1971. 20 refs*

The accidental release of approximately 15 tons of chlorine gas is described. Vegetation on farms and roadsides in the affected areas suffered damage: the leaves on trees were darkened, and coniferous trees were affected so that the needles dropped. Feed samples, although of generally poor quality due to difficult harvesting conditions, showed no significant changes in pH or chloride ion content when compared with samples collected from nonaffecting areas. Soil analyses showed no chlorine accumulation and no differences which could be attributed to chlorine exposure. Forage from the affected area had no harmful effects on three calves fed on it for one week, and there was no observable loss of palatability. Egg, milk, and cream samples showed no abnormalities when examined by a taste panel. Farm livestock including pets became sick, and in some cases died, following exposure. Several cattle died, and post mortem lesions consisting primarily of edema and emphysema of the lungs were observed. Pigs became sick, but recovered in most cases. Pet animals and poultry appeared to recover fairly quickly, while horses were more severely affected clinically and may have sustained permanent damage to the lungs. (Author summary)

32898 **APTIC NO. 55116**

Ringer, Robert K.

ADAPTATION OF POULTRY TO CONFINEMENT REARING SYSTEMS. *J. Animal Sci., 32(3):590-598, 1971. 91 refs. (Presented at the American Society of Animal Sciences, Annual Meeting, 62nd, University Park, Pa., Aug. 2-5, 1970.)*

The adaptation of poultry under the influence of the stressor agents present in confinement rearing situations is examined. These agents include bird density, cage size, temperature, debeaking, dubbing, desnooding, wing clipping, air pollution, light, and noise. Their influence on the birds is examined in terms of their effects on health, social behavior, growth, reproduction, mortality, feed conversion, fertility, egg production, and physical development. Poultry is much less susceptible than other farm animals to air pollution. However, several pollutants have had toxic effects. Most of these are outgrowths of the bacterial decomposition of poultry wastes and they include ammonia, hydrogen sulfide, carbon dioxide, and methane. Ammonia gas has been found to cause keratoconjunctivitis; tracheitis; reduced feed intake, growth, and egg production; airsacculitis; Newcastle disease; reduced respiration rate and respiratory depth; and delayed sexual maturity. Rearing replacement pullets, broilers, and turkeys in environments where more than 10 to 15 ppm NH3 exists should be avoided. Carbon dioxide and lead poisoning data are inconclusive or unreliable, but asphalt soot, carbon monoxide, H2S, and nitrogen oxides have been found to have toxic effects. Particulate matter, consisting of fecal matter, feed particles, and feather and epidermal fragments, causes irritation of the respiratory tract. While a relative humidity above 55% reduces dust, high humidity may not be the total answer.

32899 **APTIC NO. 54999**

Smith, Dixie R.

POLLUTION AND RANGE ECOSYSTEMS. *In: Man s Impact on Terrestrial and Oceanic Ecosystems. William Henry Matthews (comp.), Cambridge, Mass., MIT Press, 1971, Chapt. 8, p. 130-143. 52 refs.*

The range ecosystem contains a characteristic biotic community that functions together with the nonliving environment as a complex system. The effects of pollutants on ecosystems are complex, with the parameters most changed being diversity, structure, and the ratio of photosynthesis to respiration. Specific pollutants affecting the range include: carbon dioxide, of which the range may contribute large amounts while playing a limited role in its reduction; pesticides, which have probably not accumulated in the soils of the range ecosystem; heat, which can greatly affect the range although the latter is not a source of it; nitrogen-phosphorus-potassium fertilizers, which do not now nor probably ever will constitute a problem; radioactive compounds, which occur naturally, but some of which, resulting from atomic explosions, can be quite harmful to the range ecoystem; sediment, which is the greatest pollutant of surface waters; and particulate matter, which has several direct and indirect effects upon the range ecosystem.

32900 **APTIC NO. 54296**

Yavonenko, O. F. and M. V. Shevryakov

THE EFFECT OF BIVALENT METAL IONS AND ATP UPON THE INTENSITY OF REDUCTIVE AMINATION OF ALPHA-KETOGLUTARIC ACID IN THE EPITHELIUM OF CATTLE RUMEN WALLS. *(Vpliv ioniv dvovalentnikh metaliv ta ATF na intensivnist didnovnogo aminuvaniya alpha-ketoglutarovog kosloti v epteli stinki rubtsya velikoy rogatoy khudobi). Ukr. Biokhim. Zh., vol. 43:526-628, Sept./Oct. 1971. 20 refs. Translated from Ukranian, 8p.*

The process of reductive amination of alpha-ketoglutaric acid in the epithelial and fibrous part of cattle rumen wall was studied as affected by some bivalent metal ions and adenosine triphosphate (ATP). Manganese, cobalt, magnesium, and particularly, zinc had a stimulating effect on the process under study. The nickel ions inhibited the reaction strongly and iron ions almost caused the reaction to stop. Adenosine triphosphate evoked almost a 2.5 fold increase in the intensity of the reaction. The greatest intensity of the process was observed with the combined introduction of Zn and ATP into the incubation medium. The role of Zn in the stimulation and that of ferrous iron in reaction inhibition and on the ATP participation in this process is under investigation. (Author abstract modified)

1970

32901 **APTIC NO. 54251**

Kamieniecki, F.

THE RANGE OF THE INFLUENCE OF THE INDUSTRIAL AIR POLLUTION ON FORESTS. *(Z badan nad zasiegiem wplywu przemyslowego zanieczyszczenia powietrza na lasy). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(4(18)): 37-42, 1970. 4 refs. (Presented at the French-Polish Symposium on Air Pollution Control, Paris, France, Nov. 1969.)*

NTIS: TT 7055124/4

Damage to forests was attributed to industrial sulfur dioxide pollution. An inventorial study, based on external characteristics easily recognizable in the field, revealed that 3% of the forests in Poland are threatened or damaged. The projected increase of air pollution will bring the total area to 6% by 1985. To reverse this trend, major reforestation efforts and research aimed at pollution control are mandatory.

32902 **APTIC NO. 55066**

Nasr, T. A. and M. G. Hassouna

TOLERANCE OF BANANAS TO FLUORIDES AND SULPHUR DIOXIDE. *Alex J. Agr. Res., 18(1):115-118, 1970. 5 refs.*

The sensitivity of banana plants growing near the superphosphate plant at Kafr-El-Zayat, U.A.R. to fluorides and sulfur dioxide was investigated. The growth of the fourth ratoon plants raised in this area was compared with that of plants raised in a non-industrial area (Alexandria). The results indicated that the plants from the two areas were similar in terms of height of the pseudostem, length of the bunches, average number of hands per bunch, number of fingers per hand, and average number of fingers per hand per bunch. The plants in Kafr-El-Zayat showed no visual symptoms of foliage lesions, severe chlorosis, or necrosis. Although the margins of the lamina were dry and scorched, the same observation was made of the plants in Alexandria. The air pollutants in the area at Kafr-El-Zayat are present in concentrations not injurious to banana plants grown in the area.

1962

32903 **APTIC NO. 54298**

Liegel, W. and W. Oelschlager

SIMPLE METHOD OF IDENTIFICATION OF DAMAGE SYMPTOMS OF CHLORINE- PRODUCED PLANTS (LETTUCE AND SPINACH). *(Einfache Methode zum Nachweis von durch Chlor an Pflanzen (Salat, Spinat) hervorgerufenen Schadenssymptomen). Staub (Duesseldorf), 22(12):517-521, Dec. 1962. 8 refs. Translated from German, 17p.*

A method of identifying chlorine as the definitive cause of damage to plants was devised during fumigation experiments involving exposure to Cl_2 with three varieties of lettuce and the Vital variety of spinach. Prior to fumigation, samples were taken of the leaves and the soil. Acute emissions of Cl_2 first became manifest in typical bleaching phenomena, with the damage first showing up at the points of injury and on the undersides of the leaves. Because of the differences in acute damage occurring even in the smallest space, plant analyses clearly defined the substance perpetrating the damage. In this process the carefully conducted and appropriately carried out sampling plays an essential role, for only then can the anticipated, existing, and direct relationship between the toxically acting gas concentrations or the degree of damage and the detectable quantities of poison in the plant organs be satisfactorily obtained and demonstrated. As the degree of damage increases, so does the Cl_2 content in the leaves. While Cl_2 content in the leaves remains constant over a longer period of time in plants not totally destroyed, a contraction in Cl_2 content can be detected after a time in totally damaged test plants. By examining various soil layers for their Cl_2 content, the emitted Cl_2 acting on the plants can be recorded and used as a definitive confirmation. (Author conclusions modified)

1948

32904 **APTIC NO. 55157**

Weintraub, Robert L. and Leonard Price

INHIBITION OF PLANT GROWTH BY EMANATIONS FROM OILS, VARNISHES, AND WOODS. *Smithson. Misc. Collect., 107(17):1-13, 1948. 45 refs.*

The inhibition of plant growth by emanations from oils, varnishes, and woods is discussed. Air in contact with certain oils, varnishes, and woods acquires the property of inhibiting or markedly retarding the germination of oats, wheat, and corn, and also, to less pronounced degree, sorghum, barley, tomato, bean, lettuce, and radish. The inhibition or retardation ceases completely on removal of the seeds from the affected air. Since the active agent could be transferred in an air stream from one container to another, it is considered to be of the nature of a chemical vapor rather than some form of radiant energy. The volatile products of autoxidation of unsaturated fats include carbon dioxide, carbon monoxide, organic acids, aldehydes, and peroxides. These substances were tested for inhitatory properties. The more active compounds were some organic acids, H_2O_2 and acrolein.

1943

32905 **APTIC NO. 54301**

Gonzalez, S. de Haro

INDUSTRIAL FUMES AND THE DAMAGE THEY CAN CAUSE TO THE SURROUNDING VEGETATION. *(Humos fabriles e industriales y los danos que pueden causar a la vegetacion circundante). Ion (Madrid), 3(27):621-627, Oct. 1943. 15 refs. Translated from Spanish, 24p.*

The damage caused to vegetation by industrial acid fumes, their prevention, and procedures for their chemical analyses are discussed. Damage to plants, animals, and humans from industrial sources is caused by acid fumes, metallic chlorides and sulfates from the iron and steel industry, the chlorides, sulfites, and sulfates of soda from boiler industries and from steam generators, calcium from lime ovens, ash from the manufacture of calcinated sodas, and the sulfur dioxide from the combustion of firewood for the manufacture of charcoal. Evidence of injury in plants is raw burns or an unhealthy appearance due to chronic or slow intoxication. All salts of sulfurous acid are harmful to living organisms, and prolonged inhalation of SO_2 in doses of from 0.5/1000 can cause serious biochemical injuries as well as irritation of the mucous membrane. Methods of determining quantities of pollutants include: five methods for sulfur trioxide in the air, four for sulfurous acid, hydrochloric acid in plants, and chlorine in ashes.

Damage from acid fumes can be avoided by condensation; decomposition of SO2 by hydrogen sulfate; use of metal residue; gas scrubbing; high chimneys; and special installations based on Isaachsens formula. This is the most practical method and involves increasing the quantity of gases by air by a ventilation system.

EFFECTS-MATERIALS

1973

32906 APTIC NO. 54483

Crouch, P. C.

THE PERFORMANCE OF PLATED ABS-PLASTIC DURING ATMOSPHERIC EXPOSURE. *Trans. Inst. Metal Finish., 51(3):117-123, Summer 1973. 4 refs.*

Two series of laboratory prepared plated acrylonitrile butadiene styrene plastic panels were on static and mobile atmospheric exposure in Western Europe and Australia for between 2 1/2 and 3 1/2 yr. They were prepared with various combinations of copper, nickel, and chromium deposits including some of those recommended in BS 4601:1970 for use in outdoor environments. Adhesion failures were found on a number of panels without copper undercoats, while the use of a copper undercoat caused deterioration in appearance owing to the extensive brown staining which occurred. The performance of a given Cu-Ni-Cr system was increased by an increase in the total Ni thickness of the deposit. Nickel thicknesses greater than those given in BS 4601 are required to give adequate performance for plated plastics during atmospheric exposure. (Author abstract modified)

32907 APTIC NO. 54961

Detrie, J. P.

POLLUTION AND CORROSION. *(Pollution et corrosion). Text in French. Pollution Atmos. (Paris), 15(58):107-116, April-June, 1973.*

The parameters influencing corrosion of materials are too variable to make accurate calculations. Corrosion does not depend only upon the action of pollutants produced by human activity, but also upon temperature, humidity, and ionization. Components of the atmospheric air such as sulfur, nitrogen, chlorine, and fluorine compounds, carbon dioxide, and different oxidants also influence corrosion. In France, the sea localities of Biarritz and La Rochelle with corrosion level one, the rural locality of Saint Germain en Laye with corrosion level one, and the industrial town Saint Denis with corrosion level 2.5 were examined. Sea shore localities are more exposed to corrosion than areas with a high degree of pollution. In the United States, Pittsburgh had a decrease of SO2 from 0.15 ppm in 1926 to 0.5 ppm in 1960. In Chicago, an increase from 0.04 ppm to 0.12 ppm was noted over a 12-month period. Los Angeles has a preponderance of oxidant smogs generated by hydrocarbon emissions. Acid rains in Sweden contributed to steel corrosion. In Stockholm, at 3 C and 35 micrograms/cu m of SO2, the corrosion level was 30/micron/yr. At Flahut, the corresponding values were 3 C, 4 micrograms/cu m SO2 and a corrosion of 8 micron/yr. At Kiruna, the values were -5 C, no SO2, and a corrosion of 2 micron/yr.

32908 APTIC NO. 54878

Draeger, Hans-Joachim

THE GROWTH OF AN ALIEN LAYER IN AGRESSIVE ATMOSPHERES ON CONTACT MATERIALS USED IN POWER ENGINEERING. *(Fremdschichtwachstum bei Kontaktmaterialien der Energietechnik in aggressiven Atmosphaeren). Text in German. Elektrotech. Z. A., 94(9):562- 564, 1973. 5 refs.*

Alien layers on contact pieces used in power engineering cause an increase of the contact resistance and the contact temperature which may lead in the most unfavorable case to failure of the contact. The tendency of a material to form alien layers in polluted atmospheres thus is an important criterium for determining its applicability. The materials copper, silver 1000, Ag/nickel 90/10, Ag/cadmium 90/10, Ag/Cu 97/3, Ag/carbon 95/5, and fine-grain silver (0.15% Ni) were exposed to a hydrogen sulfide-containing test atmosphere. The test atmosphere was produced with oil-free compressed air supplied by a membrane compressor. After reducing the overpressure to about 1.5 N/sq m, the air was cleaned. For humidifying the air passes through water for a length of 70 cm. The relative humidity of 83% + or 3% is automatically achieved through this method. The aggressive gas is added by means of a membrane pump. The obtained gas/air mixture corresponds to the desired defined test atmosphere. Prior to its exit into the atmosphere it flows through a scrubber for removal of the H2S. For the tests 20 ppm H2S was added to speed up the corrosion process while maintaining an acceptable relation to the actual conditions. All examined materials had the tendency to increase formation of a sulfide layer. This property is particularly marked with Ag/C 95/5 whose growth speed of the alien layer is faster by two decimal powers than that of all other materials. The Ag/Ni 90/10 also belongs to the rapidly corroding materials.

32909 APTIC NO. 54865

Jellinek, H. H. G.

REACTIONS OF LINEAR POLYMERS WITH NITROGEN DIOXIDE AND SULFUR DIOXIDE. *Textile Res. J., 43(10):557-560, Oct. 1973. 13 refs. (Presented at the American Chemical Society, Symposium on Textile Finishing Chemistry, Division of Cellulose, Wood, and Fiber Chemistry, 164th National Meeting, New York, N. Y., Aug. 30 - Sept. 1, 1972.)*

A review of reactions of linear polymers with gases such as nitrogen dioxide and sulfur dioxide in the presence and absence of oxygen, ozone, and near-ultraviolet radiation is presented. The reactions involve random chain scission, crosslinking, incorporation of respective attacking groups along the sides of the chains, and evolution of small molecular weight compounds. The polymer degradation is sensitive to the morphology of the polymer, the percentage of crystallinity, and the size and size distribution of crystallites in the polymer films. Vinyl polymers, as a whole, suffer scarcely any chain scission on exposure to small concentrations of NO2 and SO2 with or without the presence of air and near-ultraviolet radiation. Polyethylene and polypropylene show some crosslinking due the unsaturation which is usually present in their molecules. Nylon 66 suffers chain scission in the presence of dry NO2 which is by no means negligible. Unsaturated polymers (elastomers) such as butyl rubber undergo chain scission, whereas polybutadiene and polyisoprene tend to crosslink in the presence of NO2. It is suggested that chain scission in many respects can be considered as the reverse of mutual termination in polymerization reactions where medium cages play an important role. Completion of chain scission is rare since in most instances the potential breaks are mended.

32910 APTIC NO. 54752

Knotkova-Cermakova, D., J. Vlckova and D. Kuchynka

ATMOSPHERIC CORROSION OF IRON WITH PERIODIC MOISTENING. *(Atmosphaerische Korrosion des Eisens bei periodische Befeuchtung). Text in German. Werkstoffe Korrossion, 24(8): 684-691, Aug. 1973. 13 refs.*

Periodic moistening has a considerable bearing on the model of the corrosion of iron. The frequency of condensation is much more important than the duration of the existence of a condensed layer. Immediately upon condensation a steep increase of the corrosion rate occurs. These periods of condensation thus control the rate and the intensity of the attack. The results of measurements concerning the dependence on time, and of radiochemical experiments (concerning the behavior of sulfate ions) allow the conclusion that condensation intervenes in the reaction system and affects the availability of sulfate ions at the interphase as well as the function of water. In this context the difference between adsorbed and condensed aqueous layers should be taken into consideration. A numerical index should be developed allowing the duration of accelerated corrosion to be determined in terms of the frequency of condensations.

32911 **APTIC NO. 54499**

Koike, Michio and Kyoji Tanaka

OZONE CRACKING IN SYNTHETIC RUBBER SHEETINGS. *Bull. Tokyo Inst. Technol., no. 117:55-62, 1973.*

Nine types of commercial synthetic rubber sheetings for roof system were selected to study their resistance to ozone corrosion. The tests were carried out from two different standpoints: to determine the resistance of the sheeting materials under static and repeated stretching, and to determine the resistance of roof systems composed of these materials. Dumbbell specimens of the sheetings were exposed to ozone under the two stretching conditions. Roof system samples composed of the sheetings were also exposed to ozone under conditions such that slits, which were made in the substrates, were opened both statically and repeatedly. Even if a sheeting is poorly resistant to ozone, it can be used following flexible bonding of the roof decks. (Author abstract modified)

32912 **APTIC NO. 54481**

Runner, C.

THE BEHAVIOR AND THE USES IN POLLUTED ATMOSPHERE OF CORROSION- RESISTANT, LOW-ALLOYED STEELS. *(La Tenue et les emplois, en atmosphere polluee, d aciers faiblement allies resistant a la corrosion). Text in French. Metaux, 48(573):201-206, May 1973.*

The properties and uses of corrosion-resistant low-alloyed steels, bare or coated, are described on the basis of corrosion tests performed in industrial, rural, and maritime atmospheres in the United States and France. The corrosion-resistance of low-alloyed steels is most probably due to the formation on the metal surface of thin and adhesive oxide layers, and to the production in industrial atmosphere polluted with sulfur compounds such as sulfur dioxide, of carphosiderite, an insoluble iron sulfate. For specific uses, corrosion-resistant, low-alloyed steels should be coated, for which glycerophthalic systems with total layer thicknesses ranging from 90 to 100 micron, and two-component epoxy systems ranging from 200 to 300 micron in thickness, proved best. Low-alloyed, corrosion-resistant bare steel structures have been successfully used, especially in the United States for buildings and bridges, and, in France for the equipment of a cement works.

1972

32913 **APTIC NO. 55017**

D Amico, John J. and Sidney T. Webster

METHOD OF PROTECTING RUBBER FROM DEGRADATION WITH 4-(P-(SUBSTITUTED AMINO)PHENYL) MORPHOLINES. *(Monsanto Co., St. Louis, Mo.) U. S. Pat. 3,632,550. 4p., Jan 4, 1972. 5 refs. (Appl. Sept. 20, 1967, 4 claims).*

A series of 4-(p-(substituted amino)phenyl) morpholines have been discovered to have special significance as antiozonants and are superior to Reed compounds in protecting diene rubber from ozone degradation. The compounds of significance are: 4-(p-(isopropylamino)phenyl)morpholine, 4-(p-(1-methylpropylamino)phenyl)morpholine, 4-(p-(1,3-dimethylbutylamino)phenyl)morpholine, 4-(p-(1,4-dimethylpentylamino)phenyl)morpholine, 4-(p-(1-ethyl-3-methylpentylamino)phenyl)morpholine, 4-(p-(1-methylbutylamino)phenyl)morpholine, 4-(p-(cyclohexylamino)phenyl)morpholine, and 4-(p-(N-isopropyl-N-nitrosoamino)phenyl)morpholine. Methods of preparation of each of the above are outlined.

32914 **APTIC NO. 55090**

Evans, U. R.

MECHANISM OF RUSTING UNDER DIFFERENT CONDITIONS. *Brit. Corros. J., 7(1):10-14, Jan. 1972. 14 refs. (Presented at the European Federation of Corrosion at Harrogate, Sept. 15, 1971.)*

Atmospheric corrosion of iron set up by saline dust particles can by explained by a mechanism like that of drop-corrosion. Corrosion due to moist air containing sulfur dioxide is connected with the formation of ferrous sulfate; once this is produced, the presence of sulfur dioxide in the gas phase is not needed for the continuation of rusting. Mechanistically, the anodic reaction involves the oxidation of iron to the ferrous cation, while the cathodic reaction involves the reduction of iron peroxide to iron oxide which is then oxidized by air to give a larger quantity iron peroxide. Since the fresh rust is formed at a sensible distance from the site of anodic attack, the rust, although adherent, is not protective. This action will continue only if an electrochemical conducting limb (ferric sulfate solution) and an electronically conducting limb (ferric oxide) are provided. Rust formation by this mechanism will cease if the humidity is so low that the ferric sulfate solution dries up, explaining the principle of critical humidity developed by Vernon and Buckowiecki A mechanism providing rapid atmospheric attack will be impossible if the metal does not form an electronically conducting intermediate oxide, explaining why zinc which is corroded more quickly than iron under immersed conditions suffers atmospheric attack more slowly.

32915 **APTIC NO. 54823**

Lipkin, A. M., L. K. Zolotarevskaya, A. Ye. Grinberg, Ya. A. Gurvich, L. G. Anger , S. D. Razumovskiy, and G. Ye. Zaikov

ON THE INFLUENCE OF THE STRUCTURE OF TRISUBSTITUTED THIOUREAS ON THEIR EFFICIENCY AS ANTIOZONANTS. *(O vliyanii stroyeniya trizameshchennykh tiomocheviny na effektivnost ikh kak antiozonantov). Text in Russian. Vysokomol. Soedin., Ser. A, 14(3):680-685, 1972. 12 refs.*

The influence of the structures of 11 trisubstituted thioureas, synthetized from the corresponding isothiocyanates with secondary amines, on their efficiency as antiozonants in rubber products, was studied. The rate constants of their reactions in 0.2% solutions in carbon tetrachloride with an ozone concentration of 0.05% by volume at room temperature were determined. The ozone resistance of the rubber products containing such thioureas and exposed to an O3 concentration of 0.00018% by volume was determined from the time elapsing before the formation of the first O3 cracks. The higher the rate constant of the reaction of the thioureas with ozone, the greater their efficiency as antiozonants, this dependence being an exponential one. The physical properties of the trisubstituted thioureas have strong influence on their efficiency as antiozonants in rubber only if their rates of reaction with O3 are rather high.

32916 **APTIC NO. 54729**

Sforzini, Mario

INSULATION IN A CONTAMINATED ATMOSPHERE. *(L isolamento in atmosfera contaminata). Text in Italian. Elettrotecnica, 59(3):204-223, March 1972. 53 refs. (Presented at the Testing of Power Apparatus and Systems Operating in the Megavolt Range Symposium, Manchester, England, Sept. 20-24, 1971.)*

Two types of pollution affect insulators, marine and industrial. During saline storms humid saline pollutants are deposited on insulators creating conditions favorable for electrical discharges even before the storm subsides; the same occurs during periods of saline winds. Industrial pollution affects insulators only in relatively limited areas. Pollution deposits on insulators can cause breakdowns in whole sectors of a power line network. An analysis of the phenomenon disclosed that surface discharges take place in four typical stages. The initial phase is characterized by sinusoid current, the second phase by strongly ionized electric arcs, the third phase is reached when drying of the deposit has progressed so that the passage of current is not sufficient to maintain ionization of the discharge paths. During the fourth dry phase, electric arcs occur sporadically while corona discharges and streamers develop at the edges of dry zones. Generally the gradient of critical tension depends (aside from surface resistance per unit of deposit) on the distance between the electrodes. Static models of this phenomenon describe the conditions under which total discharges come to pass. The behavior of various types of insulators exposed to pollution is tested in the laboratory by the saline fog method in an enclosed chamber or by the solid layer method where a dry deposit of known thickness is humidified by water vapor or by atomized water. A problem in these tests is the characteristics of the source of the electric current which can, if inappropriate, distort test results. Tests under natural conditions take a long but are important for the verification of laboratory tests and for the identification of environmental pollutants affecting insulators. In spite of all precautions taken in the choice of a suitable insulator for a given purpose, washing of insulators under tension or their coating with grease may become necessary.

32917 **APTIC NO. 54992**

Sparks, Allen K. and Edwin J. Latos

STABILIZATION OF RUBBER. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,645,966. 3p., Feb. 29, 1972. 5 refs. (Appl. April 17, 1970, 8 claims).*

The combination of two well known antiozonants has been discovered to produce a synergistic effect which permits the use of a lesser amount of total antiozonant in order to obtain equivalent stabilization of rubber aginst ozone cracking and offers the additional benefits of decreased blooming, improved resistance to flex cracking, and ecomonic savings. The mixture consists of from 25 to 75% by weight of N-isopropyl-N prime-phenyl-p- phenylenediamine and correspondingly from 75 to 25% by weight of N,N prime-di-sec-alkyl-p- phenylenediamine containing from 3 to 10 carbon atoms in each alkyl. The mixture also possess antioxidant properties and contributes to inhibiting oxidative deterioration of rubber. The mixture may also be used in the form of a solution or dispersion, or it may be formed as a powder or paste by compositing with a solid such as carbon black, alumina, or silicon.

32918 **APTIC NO. 55070**

Spedding, D. J.

INVESTIGATIONS INTO THE INTERACTION OF GAS-PHASE SULPHUR DIOXIDE WITH SOLID AND LIQUID SURFACES. *Clean Air Society of Australia and New Zeland, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 187-191. 31 refs. (May 15-18.)*

Radioactive sulfur dioxide was used to investigate the interaction of pollutant sulfur dioxide at atmospheric concentrations with a variety of indoor surfaces, and data from previous studies was analyzed to investigate the deposition of the pollutant on vegetation and sea water. Laboratory studies indicated that indoor surfaces having the greatest capacity to reduce indoor concentration of SO2 are emulsion paint and furnishing fabrics. Almost 75% of SO2 released within a typical house would be removed by emulsion painted surfaces according the data from experiments in a polyvinyl chloride tent containing sample materials; 15% would be removed by furnishing fabrics. Velocities of deposition of SO2 on several types of vegetation were calculated from data on previous experiments and supported the view that the planting of forests may be one means of reducing levels of pollutant sulfurous fumes. The rate of uptake of SO2 by leaves was controlled largely by the stomata. Calculation of global deposition of the gas on vegetation based on deposition rates from the laboratory experiments amounted to 5.7 times 10 to the 8 t/y which is of the same order of magnitude as that proposed by Junge in his atmospheric sulfur cycle. Previous experiments with samples of sea water suggest that SO2 is rapidly oxidized to sulfate in this medium and support the contention of Junge that some of the industrial sulfur emissions accumulate in the oceans.

32919 **APTIC NO. 54990**

Wright, Roy F.

BLENDS OF RUBBERY POLYMERS WITH BLOCK COPOLYMERS CONTAINING LACTONES. *(Phillips Petroleum Co.) U. S. Pat. 3,652,720. 7p., March 28, 1972. 1 ref. (Appl. J [illegible] 30, 1970, 10 claims).*

A blend of rubber [illegible] a lactone in the form of a copolymer, as opposed to a l[illegible]ne homopolymer, greatly improves the ozone resistance of rubbery polymers while essentially maintaining or improving tensile strength, elongation, and modulus. Conjugated diene-lactone block copolymers, containing from 10 to 90% by weight of lactone based on the total monomeric composition of the conjugated diene-lactone copolymer, are employed to impart high ozone resistance to rubbery polymers by admixing the rubber and block copolymer to form a blend composite that contains at least 9 weight% lactone, based on the total amount of polymers in the blend.

EFFECTS-ECONOMIC

1973

32920 **APTIC NO. 54950**

Babcock, Lyndon R., Jr.

A METHOD FOR ESTIMATION OF EMISSION CONTROL COSTS. *Environ. Affairs, 11(4):700-716, Spring 1973. 13 refs.*

A generalized cost estimation method called emcost is discussed and relationships are presented for six individual particulate control methods. More useful is a generalized composite relationship which consists of a single exponential equation using flue gas flow rate and recovery efficiency terms to approximate total hourly capital and operating costs for unspecified particulate pollution control equipment. Within the discretion of the user, the method is applicable to any efficiency, for any process, for which a flue gas flow rate is known or can be estimated. The described method is applied to five major sources of particulate matter: coal burning power plants, cement plants, refuse incinerators, and blast and open hearth furnaces. An expenditure amounting to 1% of product value would result in only 90% control for a coal fired electric power plant where gas flow rate is very high. The same relative rate of expenditure could achieve 99% control in a large cement plant or over 99.9% control in the steel industry processes which have relatively small gas volumes. Although emcost can approximate the cost of any level of emission control, it does not forecast the necessity or desirability of such control. (Author abstract modified)

32921 **APTIC NO. 54646**

Canty, C., F. G. Perry, Jr., and L. R. Woodland

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U. S. PULP AND PAPER INDUSTRY. *TAPPI, 56(9):52-55, Sept. 1973. 2* *refs. (Presented at the Sulfite Pulping Conference, Boston, Mass., Oct. 30-Nov. 1, 1972.)*

The economic impact of pollution abatement on the sulfite segment of the pulp and paper industry is reviewed. Three methods for treating sulfite liquor (biological treatment, by-product recovery, and incineration) are discussed with attention to utility and costs. The capital investment required to treat the bleach liquor and evaporator condensate from a 100 ton/day mill would be about $500,000, excluding land; the operating cost would be about $2/a.d. ton. An analysis of U. S. mills reveals that seven sulfite mills, having a combined capacity of 400,000 tons/yr may not be able to economically cope with pollution requirements and will probably close by 1976. Four other mills (combined capacity of 470,000 tons) have a moderate probability of closure. The result will be regional unemployment in the North Central states, New England, and the Pacific Northwest. Salutary effects on future sulfite production include an improved supply/demand balance and better use of water with increased fiber, heat, and chemical recovery to minimize pollution abatement costs. Most mills will incur comparable costs to meet water pollution requirements and should remain reasonably competitive. Air pollution costs are less well defined, but kraft mills will bear the greater burden. (Author abstract modified)

32922 **APTIC NO. 54939**

Kohn, Robert E.

LABOR DISPLACEMENT AND AIR POLLUTION CONTROL. *Oper. Res., 21(5):1063-1070, Sept.-Oct. 1973. 17 refs.*

A pollution control methods model was developed and is characterized by regional labor displacement coefficients as well as conventional cost coefficients. The model employs the lexicographic technique, minimizing first the economic cost and then the labor displacement required to achieve a specific set of air quality goals for the St. Louis airshed in 1975. Some meaningful shifts in the vector of optimal control methods are ovserved in this sequence. Some limitations in the lexicographic method become apparent in the analysis. A modified version of the technique is suggested. After optimizing the dominant policy objective, other solutions in the neighborhood of the optimal solution with respect to both the primary and secondary objectives are compared. While the area of decision making is larger than in the pure lexicographic approach, it is smaller than would be the case if the entire range of production possibilities between policy goals had to be evaluated. (Author abstract modified)

32923 **APTIC NO. 54205**

Morisugi, Hisayoshi, Ikujiro Wakai, and Koichiro Hayashi

A CONSIDERATION OF THE SOCIAL COST DUE TO AIR POLLUTION IN AN AREA. *(Chiiki ni okeru taiki osen ni yoru shakaiteki hiyo ni kansuru ichikosatsu). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, p. 49-56, 1973. (Presented at the Symposium on Civil Engineering Planning, 7th, Tokyo, Japan, Aug. 20-30, 1973.)*

Social and economic damage due to air pollution is discussed. Cost and effectiveness must be considered in developing control programs. Evaluating the amount of social sacrifice can be difficult. The amount of fuel used in an area can be considered to represent the degree of air pollution, and a correlation analysis can be performed using the consumed amount of fuel and the economic losses. Correlation of damage costs estimated from household costs with air pollution is recognizable.

32924 **APTIC NO. 55161**

Pell, Eva J.

NINETEEN SEVENTY-TWO SURVEY AND ASSESSMENT OF AIR POLLUTION DAMAGE TO VEGETATION IN NEW JERSEY. *Rutgers-The State Univ. New Brunswick, N. J., Dept. of Plant Biology, Environmental Protection Agency Contract 68-02-0078, EPA-R5-73-022, Program Element 1A1004, 45p., June 1973. 27 refs.*

NTIS: PB 223089

The economic impact of air pollution on New Jersey vegetation was studied from May 1972 through May 1973. Direct losses to agronomic crops and ornamental plantings were evaluated; crop substitution and indirect yield reduction were not accounted for. The total losses to these crops during the study period amounted to $128,019. Forty-seven percent of the plant damage was caused by oxidants, 18% by hydrogen fluoride, 16% by ethylene, 4% by sulfur dioxide, and 1% by anhydrous ammonia. Cumberland, Warren, Atlantic, and Salem Counties sustained the greatest damage. The damage reported in this survey was only 11% of that reported for New Jersey during the 1971-72 period. Reduced losses did not result from decreased air pollution concentrations but from altered environmental conditions. The unusual rainfall patterns in 1972 placed the plants under water stress and probably protected them from air pollution injury. In addition to evaluating crop losses, unknown problems were documented and research needs assessed. (Author abstract)

1972

32925 **APTIC NO. 54451**

Organization for Economic Co-operation and Development, Paris (France)

SURVEY OF POLLUTION CONTROL COST ESTIMATES MADE IN MEMBER COUNTRIES. *23p., 1972.*

Estimates of pollution control costs within various countries belonging to the Organization for Economic Co-operation and Development are surveyed. The data presented ary partly based upon published national estimates and partly upon unpublished material provided by the members of the Sub-committee of Economic Experts or by the participants of the Exploratory Meeting on Pollution Control Costs. Only data of interest from the macroeconomic viewpoint and data which reveal the relative share of pollution control costs in different industries are presented. These data are not completely comparable in that: the scope of the estimates varies with respect to the pollution control categories considered and the sectors of the economy considered; estimates of future control costs are based on different environmental policy objectives; estimates were made using different methods; the cost concepts are not the same in all estimates; there may be variations in the annual depreciation and interest costs; there are differences in the timing of the estimates; and the industrial breakdown is not the same in all countries. The estimates themselves vary between 1 and 10% of the Gross National Product. The countries surveyed are: Austria, Denmark, Finland, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

32926 **APTIC NO. 54452**

Organisation for Economic Co-operation and Development, Paris (France)

INSTANCES, IF ANY, WHERE COST/BENEFIT ANALYSIS HAS BEEN APPLIED TO ENVIRONMENTAL PROBLEMS--JAPAN. *6p., June 1, 1972.*

The cost/benefit approach as it was applied to the sulfur oxide pollution control problem in Japan is summarized. Japan's Basic Law of Environmental Pollution Control provided a legal basis for the setting up of an ambient air quality standard. An Expert Committee was established which recommended the following threshold values as maximum pollution levels for sulfur oxides: 0.05 ppm over 24 hours; and 0.10 over single hourly periods. The Policy Decision Committee was organized to decide on standards to be used as administrative performance goals and to recommend needed achievement goals. The pollution level of the moderately polluted area of Tokyo and Osaka was chosen as a standard condition. The desired benefit of the program was to keep the prevalence rate of chronic bronchitis symptoms to less than 5%, which is the rate under the standard condition. Each emission source within a heavily polluted area was allowed an hourly pollution limit of 0.2 ppm, while each source within new industrial development areas was allowed an hourly limit of less than 0.2 ppm. A diffusion formula and wind tunnel test were to be used to calculate the emission standard for each source. Based on the recommendation of the Council, the Ministry of Health and Welfare developed a draft of standards, while the Prime Minister's Secretariat provided the coordination. Based on economic, scientific, technological, and administrative considerations, it was decided that the desulfurization program would work to achieve its goal between 1973 and 1978. A clearer approach to the cost problems involved is currently being worked on.

32927 **APTIC NO. 54453**

Organisation for Economic Co-operation and Development, Paris (France)

PROBLEMS AND INSTRUMENTS RELATING TO THE ALLOCATION OF ENVIRONMENTAL COSTS. *33p., June 1, 1972.*

Methods were studied for internalizing external environmental effects in accordance with basic economic principles to ensure a rational allocation of costs. The basic approaches involve negotiation and agreement, allocation by compensation, and the application of standards and charges. The aim of the first two is to secure a rational allocation of costs in the absence of standards. The primary problem with these approaches revolves around the question of whether or not it is sufficient to manage natural resources on strictly rational economic lines. The third approach incorporates the assumption that a more or less strict body of regulations is required in addition to a rational economic policy. Among the considerations which are basic to the third approach is the use of instruments such as standards, taxes, subsidies, and auction of pollution rights for the allocation of costs. Three cases related to this consideration are reviewed. The first illustrates the use of standards and charges as practiced by the Agences de Bassin Francaises in controlling the pollution of French water resources. This system is based on the principle that who pollutes pays, and it is both efficient and equitable. The second illustrates the use of financial aids and tax abatements as practiced by the Japanese government in controlling sulfur dioxide pollution. This approach makes only partial application of the principle of who pollutes pays since part of the cost of antipollution measures is a charge on public funds. The third case illustrates the use of taxes and subsidies as practiced by the Federal German Republic in controlling the disposal of used oils.

32928 **APTIC NO. 55077**

Cortelyou, C. G.

THE COST OF AIR POLLUTION AND ITS CONTROL. *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 128-133. 10 refs. (May 15-18.) 54997 Bituminous Coal Research, Inc., Monroeville, Pa., and Dept. of the Interior, Washington, D. C., Office of Coal Research ECONOMICS OF GENERATING CLEAN FUEL GAS FROM COAL USING AN AIR-BLOWN TWO-STAGE GASIFIER. Contract 14-01-0001-324, 20p., Aug. 5, 1971.*

GPO

The capital and operating costs related to the use of an air-blown two-stage gasifier supplying a 500 megawatt boiler were estimated based on the experiences to two outside engineering companies. Costs related to equipment, labor, utility charges, and gas selling price are discussed. If the objective of in-plant gasification were merely to provide a retrofit process to produce clean, sulfur-free fuel gas, the process would not be economically feasible. However, a totally new installation which will compare favorably with other environmental control concepts is introduced.

1971

32929 **APTIC NO. 55108**

Layton, John L.

FERTILIZER PRODUCTION AND ENVIRONMENT. *Fert. Prog., 2(5):23-26, Nov.-Dec. 1971. (Presented at the TFI Fall Fertilizer Conference.)*

In the past few years numerous pollution control agencies have been established at the Federal, State, regional, and local levels, and there have also been many local and national citizens groups. To deal with these agencies and to give proper attention to the various environmental problems posed by the fertilizer industry, Agrico Chemical Division established a Department of Environmental Conservation in 1966 and Continental Oil Company established an Environmental Advisory Council in 1970. The various environmental regulatory agencies have been writing, rewriting, and promulgating new rules and regulations at such an escalated pace that it is difficult for industry to determine its present compliance status. In deciding whether to close down a plant which has been found to be in noncompliance with new regulations or to reach compliance, the economics of the situation must be examined. Costs of compliance include control equipment installation, maintenance, and replacement costs; the costs of legal services; and the costs of meeting safety and health standards and regulations applying to noise pollution and sound conservation. The phosphate industry also faces specialized environmental problems relating to particulate emissions from transportation. The cost of emission control in 1966 to comply with air quality regions, ambient air and emission criteria, and air pollution episode regulations was $25,240,730.

STANDARDS AND CRITERIA

1973

32930 **APTIC NO. 54200**

Ministry of International Trade and Industry (Japan), Public Nuisance Resources Research Inst.

IMPROVEMENT OF MINISTERIAL ORDINANCE RELATED TO THERMAL POWER ACCOMPANYING THE IMPROVEMENT OF AIR POLLUTION PREVENTIVE LAW AND REGULATIONS RELATIVE TO THE APPLICATION OF THE LAW. *(Taiki osen boshiho shikorei oyobi shiko kisoku no kaisei ni tomonau karyoku kankei shorei no kaisei ni tsuite). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 24(8):967-969, Aug. 1973.*

The regulations for nitrogen oxide emissions according to the Air Pollution Prevention Law of Japan were revised on Aug. 2, 1973. The ordinance concerning thermal power plants was also revised. Equipment and operating criteria are specified in the regulations. The amount of nitrogen in fuel was limited. Enforcement rules and Nox measurement methods were also revised.

32931 **APTIC NO. 55189**

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

BACKGROUND INFORMATION ON DEVELOPMENT OF NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS: ASBESTOS, BERYLLIUM, AND MERCURY. *APTD-1503, 100p., March 1973. 135 refs.*

NTIS: PB 222803; GPO

The preamble to the National Emission Standards for Hazardous Air Pollutants (asbestos, beryllium, and mercury) sets forth: the bases for the Administrator s determination that asbestos, beryllium, and mercury are hazardous; the derivations of the final standards promulgated; the EPA s response to the significant comments received; and the principal revisions to the proposed standards. A more detailed discussion of the statements made in the preamble is presented. A section on general provisions discusses the applicability of the standards, approval for construction or modification, notification of startup, waiver of compliance, source reporting, and source sampling and analytical methods. Each of the three hazardous materials is then discussed in terms of health effects, development of the standard, evaluation of comments, environmental impact, and economic impact.

32932 **APTIC NO. 54345**

Imagami, Kazunari

THE PRESENT CONDITION FOR THE MEASUREMENT OF AIR POLLUTION IN JAPAN. *(Waga Kuni ni okeru taiki osen deisoku no genjo). Text in Japanese. Iyo Denshi to Seitai Kogaku (Jap. J. Med. Electron. Biol. Eng.), 11(3):147-155, June 1973. 5 refs.*

The present condition and anticipated future trends related to the measurement of air pollution in Japan are described. Air pollutants such as sulfur dioxide, oxides of nitrogen, carbon monoxide, oxidants, hydrocarbons, and particles are mainly measured by local self-governing bodies and national air pollution measuring stations. The methods used in measuring these air pollutants at their sources and in the environment are those provided for in the Japanese Industrial Standards or in the Air Pollution Control Law. These methods are described.

32933 **APTIC NO. 54503**

Kirk, Alan G., II

MOTOR VEHICLE POLLUTION CONTROL. CALIFORNIA STATE STANDARDS: NOTICE OF PUBLIC HEARING. *Federal Register, 38(185):26760-26761, Sept. 25, 1973.*

Section 209(a) of the clean Air Act, as amended, states that no State or any political subdivision thereof may adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines, or require approval relating to the control of emissions from said sources as condition precedent to the initial retail sale, titling, or registration of such vehicle or engine. It further states that the Administrator of the EPA may waive application of this prohibition to any state which had adopted standards for the control of emissions from new motor vehicles or new motor vehicle engines prior to March 30, 1966. In that California had, prior to March 30, 1966, adopted standards for the control of emissions from new 1975 model year motor vehicles, this state has renewed it s request for waiver of the prohibitions of section 209(a) with respect to its proposed standards for 1975 vehicles. Available information appears to require the granting of this request and notice is given that a public hearing on the request will be held in California on Oct. 2, 1973. Discussed will be whether the standards adopted by California for hydrocarbons, carbon monoxide, and oxides of nitrogen and related test and enforcement procedures applicable to new 1975 model year, light duty trucks are required to meet compelling and extraordinary conditions in California, and whether such standards are consistent with section 202(a) of the Clean Air Act.

32934 **APTIC NO. 54399**

Quarles, John

CEMENT MANUFACTURING POINT SOURCE CATEGORY. EFFLUENT LIMITATIONS GUIDELINES FOR EXISTING SOURCES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS FOR NEW SOURCES. *Federal Register, 38(173):24462-24464, Sept. 7, 1973.*

Effluent limitations guidelines for existing sources and standards of performance and pretreatment standards for new sources were proposed by the Environmental Protection Agency for the cement manufacturing category of point sources. The pollutants contained in raw waste water resulting from cement manufacturing are principally dissolved (potassium and sodium hydroxide, chlorides and sulfate), suspended solids (calcium carbonate) and waste heat. Five alternative control and treatment technologies and the attendant costs have been identified for the cement manufacturing category: two for the nonleaching subcategory and three for the leaching subcategory. The first alternative for the nonleaching subcategory involves recycling and reuse of all water used in treatment of runoff from kiln dust piles. The second involves water reuse and in-plant controls of water used in scrubbing or treatment of runoff from dust piles. The first alternative for leaching involves segregation and treatment of the leachate stream. Treatment of the leachate stream consists of neutralization of the leachate with stack gases followed by secondary sedimentation to remove both the residual suspended solids and the solids created by neutralization with carbon dioxide. Another alternative would be abandonment of existing leaching operations; plants which presently leach kiln dust would instead adopt the first or second alternative for nonleaching plants which result in essentially no pollution. Cost of dust disposal is estimated to be $0.50/ton. Additional solid wastes would be generated by increased use of sedimentation, but the amount would be quite small compared to the larger quantity of kiln dust normally wasted.

32935 **APTIC NO. 54572**

Quarles, John

INTERIM STANDARDS FOR 1976 MODEL YEAR LIGHT DUTY VEHICLES. *Federal Register, 38(161):22474-22475, Aug. 21, 1973.*

The effective date of the 1976 emission standards for oxides of nitrogen has been suspended for those manufactures who requested such suspension. The decision also established an interim nitrogen oxides emissions standard for light duty vehicles to be sold in the 1976 model year; and to ensure that this interim standard will be incorporated in proper form in the Code of Federal Regulations, it is being republished as follows: the interim nitrogen oxides emissions standard prescribed for 1976 light duty vehicles of manufactures who have been granted a suspension is 2.0 g/mi. The NOx emissions standard of 0.4 g/mi originally promulgated on July 2, 1971 for the 1976 model year remains in effect for those manufacturers who have not applied for and received a suspension and will become effective for all manufactures beginning with the 1977 model year.

32936 **APTIC NO. 54578**

Quarles, John

SULFUR OXIDES. *Federal Register, 38(178):25678-25681, Sept. 14, 1973.*

Notice is given that the annual secondary sulfur dioxide standard is revoked, and announcement is made concerning a revision to Air Quality Criteria for Sulfur Oxides and concerning conclusions from a reevaluation of the basis for the secondary 3-hour average SO2 standard. The 60 microwaves/cu m (0.02 ppm) annual secondary standard is revoked, and the maximum 24-hour concentrations of 260 micrograms/cu m (0.1 ppm) published as a guide to be used in assessing implementation plans to achieve the annual standard is deleted. A revision to Chapter 5, Effects of Sulfur Oxide in the Atmosphere on Vegetation, of the Air Quality Criteria for Sulfur Oxides includes the results of a number of studies completed since initial publication of the Criteria Document in 1969 and also includes reanalysis of older data in the light of new information. The revised vegetational portion of the Air Quality Criteria for Sulfur Oxides has been judged to provide the only adequate basis for the secondary National Ambient Air Quality Standards for Sulfur Dioxide. Reevaluation of the 3-hour SO2 standard has led to the conclusion that the current secondary standard (1300 micrograms/cu m maximum 3-hour concentration) is adequate and necessary to protect the public welfare from adverse effects.

32937 **APTIC NO. 54934**

Quarles, John

EMISSIONS DURING STARTUP, SHUTDOWN, AND MALFUNCTION. *Federal Register, 38(198):28564-28566, Oct. 15, 1973.*

Amendments to Part 60 of Title 40, Code of Federal Regulations are presented. The May 2, 1973 proposal required that stationary sources be operated and maintained in a manner consistent with operations during the most recent performance test indicating compliance. The advisability of requiring that all of the operating conditions that happened to exist during the most recent performance be continually maintained was questioned. In response to these comments, the Environmental Protection Agency revised this requirement to provide that affected facilities shall be operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions. Specifically, changes were made in notification and recordkeeping, performance tests, compliance with standards and maintenance requirements, emission and fuel monitoring for opacity, sulfur dioxide, and nitrogen oxides, and emission monitoring.

32938 **APTIC NO. 54857**

Tohata, Heiichiro

EMISSION REGULATION FOR NITROGEN OXIDES AND COUNTERMEASURES AGAINST IT. *(Chisso sankabutsu no haishutsu kisei to taisaku). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 3(5): 636-639, Nov. 1973.*

The present maximum daily concentration of nitrogen dioxide in Japan is 0.02 ppm, and it is to be implemented within 5 to 8 years. Emission standards have been set to regulate large scale stationary sources. Absolute amount regulations, the so-called K value regulation, was set for sulfur dioxide and the same standards should be set for NO2. This emission standard is provisional and should be lowered even more, but adoption of overly severe regulations will lead to rises in price and other problems. The average for NO2 in the U. S. is 0.05.

32939 **APTIC NO. 54978**

Train, Russell E.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. CERTIFICATION OF NEW VEHICLES INTENDED FOR INITIAL SALE AT HIGH ALTITUDES--1976 MODEL YEAR. *Federal Register, 38(197):28302-28305, Oct. 12, 1973.*

Amendments to part 85, Title 40 of the Code of Federal Regulations as applicable to 1976 and later model year light duty gasoline fueled vehicles, light duty diesel vehicles, and light duty trucks are presented. The regulations would require manufacturers to certify new motor vehicles destined for initial sale at high altitudes to comply with emission standards at those altitudes. Vehicles which were not so certified could not be legally sold at high altitudes. The regulations would require mileage accumulation and testing under high altitude conditions of one emission data vehicle per engine system combination within an engine family in all cases in which such vehicles are intended for initial sale above 4000 ft. This emission data vehicle must accumulate its 4000 mi under high altitude conditions. Manufacturers whose projected sales of new motor vehicles at high altitude are fewer than 1000 vehicles per engine family may request a reduction in the number of test vehicles per applicable engine family.

LEGAL AND ADMINISTRATIVE

1973

32940 **APTIC NO. 54208**

Ministry of International Trade and Industry (Japan)

AN INTERIM REPORT OF A SUBMEETING FOR COUNTERMEASURES AGAINST AUTOMOBILE POLLUTION. *(Jidosha kogai taisaku shoiinkai chukan hokoku). Text in Japanese. 17p., Aug. 1973.*

A council was set up to study control methods and programs to reduce automotive pollution in Japan. Control programs for reducing automotive emissions are discussed, including planning and zoning, development of new power sources, control methods, and emission standards. Control methods for lead particles, carbon monoxide, hydrocarbons, and nitrogen oxides emitted by cars are discussed. The engine structure and fuel composition can influence the amount of emissions. Catalytic cleaners are being studied as a control device.

32941 **APTIC NO. 54209**

Ministry of International Trade and Industry (Japan)

OUTLINE OF COUNTERMEASURES AGAINST CAR POLLUTION SINCE THE INTERIM REPORT. *(Chukan hokoku igo no jidosha kogai taisaku no gaiyo). Text in Japanese. 19p., Aug. 1973.*

A council was set up by the Japanese Ministry of International Trade and Industry to develop control programs for automotive pollution and to develop standards. Engine design and operation modifications to reduce pollution, improvement of gasoline, and development of new power sources are discussed. Research programs are being sponsored by several Japanese agencies. Electric and gas turbine cars are being developed.

32942 **APTIC NO. 54335**

Japan Environmental Agency

AN OUTLINE FOR THE 1974 PLANS AND PROGRAMS OF JAPAN ENVIRONMENTAL AGENCY. *(Showa 49-nendo Kankyocho juten shisaku no gaiyo). Text in Japanese. Aug. 1973. 38p.*

An outline for the 1974 environmental protection plans and programs by the Japan Environmental Agency is presented in a table form, including the main programs, the 1973 budget, the 1974 proposed budget, the differences, and remarks. The complete budget for the 1973 plans and programs was $40,880,461. The proposed 1974 budget is $70,909,149. Of this amount, $859,954 is proposed for air pollution control programs for 1974, showing an increase of $51,578 over the budget of 1973. Air pollution control programs include the following items: reestablishment of the total environmental standards, pollutant emission standards, the basic investigation for the 1975 sulfur dioxide standard and other pollutants, investigations for SOx standard designated areas, investigations for the measurement method for nitrogen oxides emission, establishment of NOx emission standards, the method for SOx emission quantity allotment, and the basic unit of pollutant emission. Basic studies for emission standards for hydrocarbons, fluorides, aldehydes, and vanadium will be conducted.

Smaller projects include the revision and reenforcement of air pollution emission standards, 13 additional substances on the list of pollutants, investigations on photochemical reactions using plant indicators, protection measures for plants, basic studies for fuel standards, regulation and enforcement for automobile noises and emissions, indemnity for pollution victims, research on pollution diseases, research on photochemical smog prevention, protection of the natural environment, flora and fauna, and establishment of new parks and cleaning of national parks.

32943 **APTIC NO. 54602**

Environmental Protection Agency, Washington, D. C., Advisory Committee

SUMMARY OF FINDINGS. *In: Highways and Air Quality Special Report 141, p. 3-25, 1973.*

The status of emission reduction from light-duty motor vehicles and techniques which can be used in the planning and operation of transportation systems and facilities to minimize motor vehicle air pollution and its impact are presented. The Environmental Protection Agency has concluded that emission reductions of new motor vehicles as required by the Federal government will not by themselves be sufficient to meet national primary ambient air quality standards by 1975 in 39 urban areas throughout the country. Thus, attention is being given to various transportation control strategies designed to provide supplementary controls on motor vehicle emissions, to increase the efficiency of traffic flow, and to reduce vehicle-miles of travel. Some of the control strategies which states may employ are: emission limitations; Federal or state emission taxes; closing or relocation of residential, commercial, or industrial facilities; changes in schedules or operational methods of industrial facilities or transportation systems; and many other supplemental measures. The improvements in air quality to be derived from transportation control strategies will vary from city to city, and specific strategies must be examined within the context of specific situations. Failure to do so could result in cancellation of air quality benefits by increased traffic volumes.

32944 **APTIC NO. 54603**

Environmental Protection Agency, Washington, D. C., Advisory Committee

OBSERVATIONS AND COMMENTS. *In: Highways and Air Quality Special Report 141, p. 26-29, 1973.*

Land use control is one of several major strategies which have been overlooked in air quality implementation plans. Major land use proposals already in the working for residential housing, office buildings and transportation facilities could have a significant effect on ambient air quality because of the motor vehicle traffic that would be generated or attracted by the new development. Mini-episode control is another possible control that has received comparatively little emphasis, at least insofar as mobile sources of air pollution are concerned. Such strategies developed to deal specifically with the problem of automobile pollutants might be effective in those urban areas that can expect to exceed the national ambient air quality standards on only a limited number of days each year. A third overlooked transportation control strategy is the diversion of natural gas from interruptible commercial users for use in motor vehicles. It may be possible in some cities to increase the supply of available natural gas by diverting a portion now going to interruptible commercial users such as power plants to use by motor vehicles; the gasoline that would otherwise have been used by the power plants. A general problem with transportation and land use controls thus far has been the limited degree of analysis that could be applied to various alternative strategies. Many of the shortcomings resulting from limited analysis can be overcome by providing for a dynamic control strategy process that will make adjustments for factors such as new data, new control technologies, and changes in life style.

32945 **APTIC NO. 54607**

Environmental Protection Agency, Washington, D. C., Working Group 3

IMPLICATIONS FOR TRANSPORTATION PLANNING. *In: Highways and Air Quality Special Report 141, p. 62-69, 1973.*

The process of integrating air quality considerations into transportation planning can be structured by changes in the organizational structure of the transportation planning process, addition of items to the work program of that process, revision of the process to ensure the environmental assessment of various system alternatives, and development of greater citizen involvement in the process through public hearings. The following recommendations are proposed regarding activities that should be included in the planning work program of the transportation planning agencies at the state and metropolitan levels: an evaluation of air quality should be incorporated as a part of the planning process; a unified work program should be developed with allied planning organizations to ensure that all available planning resources at Federal, state, and local levels are integrated and effectively used; impact of air quality as it relates to transportation should be evaluated for the short, medium, and long term, with the short term being best evaluated at the local level; regional air quality considerations should include short-, medium-, and long-term periods; analytical tools for determination of air quality effects of long-range transportation systems are required; consideration should be given to the type and location of air pollution emissions related to transportation sources, air quality resulting from transportation related emissions, and the incidence of air quality on land use and sensitive receptors in the development, testing, and evaluation of alternative long-range transportation systems that work toward achievement of air quality; long and short-range transportation and air pollution control studies must be integrated to ensure compatibility and must be integrated with the unified work program; and the contribution to urban air pollution of intracity freight movement by trucks must be recognized.

32946 **APTIC NO. 54608**

Environmental Protection Agency, Washington, D. C., Working Group 4

INSTITUTIONAL RELATIONS FOR IMPLEMENTING SOLUTIONS. *In: Highways and Air Quality Special Report 141, p. 70-80, 1973.*

Specific issues are identified in regard to institutional relations in the development and implementation of land use and transportation strategies to reduce air pollution. Numerous recommendations are proposed for the following issues: communication among state agencies, coordination between state and local agencies, coordination of land use and transportation strategies, strengthening of regional planning, previously planned projects and air quality, projects not Federally funded, air quality analysis for environmental impact statements, arrangements for implementing control strategies, state and local participation in Environmental Protection Agency research on control strategies, vehicle emission data, and public information on air pollution control issues.

32947 **APTIC NO. 54751**

Environmental Protection Agency, Washington, D. C.

APPROVAL AND PROMULGATION OF COMPLIANCE SCHEDULES, CORRECTION. *Federal Register, 38(181):26324-26344, Sept. 19, 1973.*

Tables relating to the compliance schedules for the state air implementation programs are corrected. The tables indicate emission sources, their locations, the regulations involved, the dates of adoption, the effective dates, and the final compliance dates. Counties within the following air quality control regions are included: 048, 049, 050, and 051.

32948 **APTIC NO. 54794**

Environmental Protection Agency

TRANSPORTATION CONTROLS. *Preprint, 5p., 1973.*

Transportation control measures which are required for any air quality control region where controls on stationary sources combined with Federal new car emission standards are inadequate to attain and maintain ambient standards set forth by the Environmental Protection Agency in 1971 are of two general types: those which reduce emissions from individual motor vehicles and those which reduce emissions from all vehicles as a class. The timetable for transportation controls requires that all state plans be approved or alternative plans be promulgated by the Environmental Protection Agency as of Aug. 15, 1973, that the states must have adopted regulations, ordinances, and legislation to implement the plans by Dec. 30, 1973, and that the states must meet ambient air quality standards except where extensions are granted by the EPA by May 31, 1975. The controls are necessary in view of the fact that of the three major pollutants attributable to fuel combustion, 70% of the carbon monoxide, 50% of the hydrocarbons, and 30% of the nitrogen oxides are contributed by mobile sources in major American cities. Approvals, disapprovals, and extensions are listed for various control regions.

32949 **APTIC NO. 54490**

Allen, Philip W.

REGIONAL AIR POLLUTION STUDY--AN OVERVIEW. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 23p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-21.)*

The EPA regional Air Pollution Study (RAPS) has as its objective the development and validation of mathematical simulation models of the atmospheric processes that determine the transport and air concentrations of pollution. Components of the RAPS research program include the laboratory and field experiments needed to develop chemical and photochemical transformation submodels, particle dynamics submodels, and pollutant removal submodels. They include the analysis and development of computer routines to integrate the many submodels into a complete model system. The RAPS field program will acquire the very extensive data bank needed for testing submodels and eventual model validation. An important part of the data bank will be an emissions inventory and appropriate emissions submodels in much greater detail as to time and character of emissions than has been achieved before on a regional scale. Meteorological information will be acquired on a scale appropriate for delineating urban scale changes in transport and dispersion. The results of chemical analyses and other special measurements will be added to the data bank, which will be accessible by qualified users. The St. Louis facility, to be built and operated by a prime contractor, will include a 25 station network of automated air quality analyzers, meteorological measurements, and sample collectors. It will also include helicopter and truck measurement platforms and atmospheric sounding equipment. Measurements will be made routinely for about 3 years for general model validation and expenditures will be used to gather more extensive data for specific submodel formulation. As air pollution models become validated, they will be stored on a computer system and made available to Federal, state, and local control agencies by remote terminal, for their use in testing control strategies. (Author abstract modified)

32950 **APTIC NO. 54587**

Arvai, Jozsef

AIR POLLUTION CONTROL MEASURES ENVISAGED FOR THE FOURTH 5-YEAR-PLAN PERIOD. *(A levegotisztasag-vedelem teruleten varhato intezkedesek a IV. oteves terv idoszakaban). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(4-5):181-190, 1973.*

Technical, legal, and economic measures envisaged in clean air maintenance area during the 4th 5-year-plan period in Hungary are surveyed. Scientifically and technically substantiated ground-level concentration standards will be established for the different pollutants and for different protection zones (urban, industrial, residential, or rural), and specific emission standards will be elaborated for the industrial and other plants individually, on the basis of relationships between emissions and ground-level pollutant concentrations, with respect to the local background concentrations and to the specific orographic and micrometeorological conditions. Lower and upper emission limits, based on a compromise between economic and technical possibilities and hygienic requirements, will be first established for particulate matter, sulfur dioxide, ammonia, nitrogen oxides, fluorine, and chlorine. Industrial plants, equipment, and whole technologies will have to be designed with respect to the set emission standards. Air pollution monitoring network, including six regional stations throughout the country, will be set up. Ground-level concentrations will be measured by the Authority of Public Health and Epidemics, while emission measurements will be run by the Institute for Quality Control of Building Materials and Construction. Industrial plants causing air pollution beyond the set limits will be fined. During a transitional period, such industrial plants are required to contribute to the Fund for the Protection of Clean Air, which will be partly reimbursed to the individual plants for the implementation of air pollution control techniques, and partly used centrally for air pollution control-related research.

32951 **APTIC NO. 54536**

Ashby, Eric

PROSPECT FOR POLLUTION. *Roy. Soc. Arts J., 121(5203):443-454, June 1973. 10 refs.*

The effect of scientists, economists, and publicists on pollution abatement are discussed. Three cases studied are explored to illustrate how their interrelationship can affect decisions about the environment. The public preferred detergents over soap until it was revealed that detergents cause foaming in water. The problem was voluntarily solved in England by industry who substituted an unbranched alkyl benzene sulfonate which was degradeable. In the United States panic legislation was passed to eliminate phosphates from detergents. Industry developed a substitute sodium nitrilo triacetate (SNTA). Senate hearings revealed that SNTA in theory could react with nitrates to produce secondary nitrosamines which may be carcinogenic and public opinion against phosphates was reversed. This points out the need for a thorough examination of any problem by the scientist, economist, and the publicist. Exhaust emission abatement will increase the cost of an automobile in England by $50,00 and in the U. S. by $375.00. Public opinion will compel politicians to legislate on car emissions, but it is questionable if the additional cost is in the public interest. Carbon monoxide is toxic, but compared to cigarette smoking, standing in dense traffic is harmless. Two other environmental effects on man are consumption of goods and services per head and the density of the population. The public is willing to spend money to abate pollution, but is not ready to demand legislation for population control and reduction in per capita consumption of goods and services. The final decision in environmental control is made by scientists who have the obligation to predict the consequences of man s impact on nature.

32952 **APTIC NO. 54544**

Augustin, Egon

THE PROGRAM OF THE EUROPEAN COMMUNITY FOR THE PROTECTION OF THE ENVIRONMENT. *(Aktionsporgramm der Europaeischen Gemeinschaft fuer den Umweltschutz). Text in German. Erdoel Kohle (Hamburg), 26(9):540-541, 1973.*

The Commission of The European Community has presented an impressive program concerning the protection of the environment. The program calls for a study of the following substances, lead and lead compounds, hydrocarbons which are known or presumed carcinogens, sulfur compounds, aerosols, oxides of nitrogen, carbon monoxide and phenols. The study shall be completed by Dec. 1974. Uniform limit values in the environment and in products shall be worked out for these pollutants. Moreover, the extent of air pollution by power plants, refineries, domestic heaters, and combustion engines shall be investigated. According to the French view the program is too ambitious. The European Community lacks the legal basis for putting it into action. It was agreed that the European Community will assume all coordinating tasks while the individual items on the program will be carried out by the member nations.

32953 **APTIC NO. 55268**

Bradley, Michael D.

RESIDUALS MANAGEMENT AND ENVIRONMENT QUALITY. *Biol. Conserv., 5(3):215-219, July 1973. 7 refs.*

Basic economic concepts are applied to the problems of residuals management for environmental quality. Residuals management comprises an important part of effective environmental quality management, and the assimilative services provided by the natural environment are essential inputs into man s production and consumption activities. The failure to appreciate the external effects of residual discharges, however, has led to excessive uses of environmental assimilative capacity. The policy choices for environmental quality management involves decisions about the wisest use of common property environmental resources, as balanced against other social needs and the production of goods and services. Examining the conjunctions of economics and ecology, as related to environmental quality, suggests six fundamental needs for future policy. The most important need is to establish the principle that firms or individuals should pay an equitable portion of the full costs of their residuals. Flexible tools for residuals management are needed to supplement uniform emission standards, single medium pollution control laws, and the exclusive use of legal penalties as an enforcement mechanism. The most critical need is for development and implementation of operational environmental criteria for planning. Planning must proceed on the basis of the wisest use of common property resources, beginning with those resources such as inshore seas and coastal areas that overlap jurisdictional lines and boundaries. The access of citizens to the planning process, at all levels of government, must be increased.

32954 **APTIC NO. 54570**

Browne, L. W. B.

POLLUTION RESEARCH IN THE UNITED KINGDOM. *Clean Air, 7(2):41-43, May 1973. 5 refs.*

Pollution research being conducted at the Warren Spring Laboratory, one of the major centers of air pollution research in the United Kingdom, is described. A large number of measurements of the grit and dust deposition conducted at W.S.L. have shown that there has been no general change in median or peak values since 1963. Measurements of smoke and sulfur dioxide are being made at eight background sites in the United Kingdom as part of a European Network of sites to determine the distribution and trend in background levels of pollution. A special open-circuit wind tunnel has been constructed at W.S.L. to determine, by model studies, the optimum siting and height of chimneys. Two projects are being undertaken to study long range transport of sulfur pollutants: the first project consists of sampling sulfur pollutants with aircraft, sampling at ground level sites, determination of the uptake of sulfur dioxide by vegetation, and estimation of sulfur dioxide emission; the second is concerned with the relative importance of local and distant sources of sulfur pollutants in respect to their contribution to the air pollution over a region. A five year survey of urban pollution, particularly from the automobile, involving five selected towns with measurements being taken every five minutes has been set up to monitor carbon monoxide, total hydrocarbons, oxides of nitrogen, sulfur dioxide, and ozone. Lead particulates and total particulates are also investigated. Other work such as the suppression of odors and methods for measuring airborne and deposited metals is also in progress.

32955 **APTIC NO. 54459**

Cherkinskiy, S. N.

PROTECTION OF THE ENVIRONMENT FROM POLLUTION. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 10-13, APTD-1366. Translated from Russian. (Also: Problemy Okhrany i Ratsional nogo Ispol zovaniya Prirodnykh Resursov, 1968:38-42, 1968.)*

NTIS: PB 214264

Soviet legislation specifies a natural, organic bond between sanitary objectives toward improvement of the environment, and objectives of nature preservation as a whole. Criteria for pollution levels are measured by a hygienic standard, which is an index of the composition and properties of the environement which excludes an adverse influence on health and ensures favorable living conditions for the population. These standards are based on physiological, pathophysiological, sanitary toxicological, biochemical, histological, histochemical, sanitary chemical, and sanitary-bacteriological studies. Based on these standards, air pollution would be mitigated by gasification of apartments and central heating of towns and industrial centers. Water pollution regulations are also mentioned.

32956 **APTIC NO. 54314**

Conklin, Keith J.

ANALYSIS OF SEMI-AUTOMATED PERMIT PROCESSING PROCEDURES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1973. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-257.)*

The establishment, in 1970, of the new Illinois Air Pollution Control Regulations increased the responsibilities and the workload of the Permit Section. The increase in responsibility and workload could not be handled by existing section procedures, so it became necessary to change the existing methods and procedures to meet the new demands placed on the permit processing system. Efforts were concentrated on improving communication, modernizing clerical procedures, and minimizing the non-engineering work done by engineers. Communication aids developed include: the Traveler Sheet, which provides a continuous indication of the status of the application and a record of the processing steps; the Engineering and Clerical Aid Sheet, which minimizes clerical work by engineers, aids in engineering-clerical communications, and assures a thorough application examination; and the Status Update Sheet, which is used to communicate both the status of the application and the appropriate grant or deny letter. Manual task reduction aids include: a computer system to air permit processing by reducing the clerical workload and communicating information; a passive Information File, which stores information concerning the pollutants emitted by source; a programmable calculator, which aids in predicting the performance of pollution control equipment and is used to calculate the dispersion of air contaminants from single or multiple emission sources; and a magnetic tape typewriter, which enhances clerical productivity. A possible alternate system for control agencies with a less comprehensive permit program would require a magnetic tape typewriter, a programmable calculator, and a production control board. (Author summary modified)

32957 ***APTIC NO. 54854***

Edel, Matthew

AUTOS, ENERGY, AND POLLUTION. Environment, 15(8):10-17, Oct. 1973. 12 refs.

The institutions of urban life and the political economy of the petroleum industry are examined in light of the forces that limit the options open to residents who pollute the air through automobile use. Studies on the effectiveness of fare reduction and mass transit subsidizing to counteract automobile use in congested and polluted areas have shown that cutting fares by half would increase transit use by less than 10% and that the increased transit use does not result from a shift away from automobile use. Thus free transit alone will not lure a significant number of passengers away from their cars and public transit must be fast and automobile use very expensive before such a shift will occur. The basic problem is viewed as one consisting simply of a lack of realistic alternatives to automotive transportation. Subways have not been built to follow residential migration from urban to suburban areas, service has not been adequate, and fares have not been competitive with the cost and time-saving returns of automotive transportation. No well-designed, well-operated, and adequately subsidized public transit system has ever really been given the chance to attract riders.

32958 **APTIC NO. 54571**

Ermenc, E. D.

AIR POLLUTION CONTROL IN THE CINCINNATI REGION. *Cincinnati J. Med., 54(7):181-182, Aug. 1973.*

The air pollution control system in the Cincinnati region is characterized by the State of Ohio permit system for operating, variance, and construction of industrial, commercial, and institutional facilities and the new Cincinnati Region air pollution index. The index ranges from values of 100 to 400; 100 refers to conditions meeting ambient air standards; 200 is an alert condition which may affect portions of the population with lung problems; 300 designates a warning which could affect a good share of the population adversely; and 400 is an emergency condition affecting most of the population and industry not yet in compliance. The prime pollutants in the Cincinnati Region are suspended particulate matter and photochemical oxidants, classified as Priority I pollutants. Alerts are reached only for photochemical oxidants, and warning and emergency levels have never been reached. Although an alert for suspended particulate matter has never been reached, the attainment of the State Standard of 60 micrograms/cu m appears to be a difficult goal. Presently, reading at the downtown Public Library average around 90 micrograms/cu m.

32959 **APTIC NO. 54575**

Gallion, John W. and John H. Stallings

STRATEGY FOR CONTROL OF SULFUR OXIDE EMISSIONS IN OKLAHOMA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 25p., 1973. 5 refs. (Presented at the Air Pollution Control Association Annual Meeting 66th, Chicago, Ill., June 24-28, 1973, Paper 73-243.)*

Oklahoma's Regulation No. 16 for controlling sulfur oxide emissions requires the maximum technically feasible control for new equipment. It also requires that existing equipment never cause ambient air quality levels to exceed 0.52 ppm for 5-minute average, 0.46 ppm for a 1-hour average, 0.25 ppm for a 3-hour average, or 0.05 ppm for a 24-hour average. An important concept incorporated in the regulation is the use of atmospheric diffusion modeling results as prima facie evidence that these levels have been exceeded. Existing sources are thereby controlled sufficiently to keep the ambient air quality well below the federal secondary ambient air quality standard, and significant deterioration of the present air quality is prevented. In order to allow rapid calculation of ground level concentrations around existing point sources, plume rise and atmospheric diffusion equations have been put on a statistical type programmable calculator. This allows the automatic sequential calculation of expected downwind ground level concentrations of sulfur oxides for 16 downwind distances and 16 wind directions in 15 minutes of calculator time. The program also includes equations expressing the mean stability for Oklahoma which would be expected to occur most frequently, and is written so that equations for any stability may be substituted. The use of this procedure at zinc smelters and petroleum refineries is described, and procedures are shown for the addition of nearby point sources. Comparisons of calculated ground level concentrations with actual maximum concentrations measured by sampling reveal only a 17% difference. (Author abstract modified)

32960 **APTIC NO. 54604**

Garrison, William L.

OPENING REMARKS AT THE AIR QUALITY WORKSHOP. *In: Highways and Air Quality Special Report 141. Environmental Protection Agency, Washington, D. C., p. 30-33, 1973.*

The immediate environment for the issue of highways and air pollution is viewed as somewhat constrained due to the lack of a knowledge base on which to generate and evaluate alternative control strategies and the lack of a process that will couple societal objectives and judgments to plans and to action. Not only is knowledge lacking about the efficacy of alternatives such as retrofit, gaseous fuel conversion, and inspection and maintenance, but also future Environmental Protection Agency policy and practice are not known. Contextual shifts for what is becoming a tertiary, service-oriented society and their implications for societal organizations, investment in human resources, broadened opportunities for self-actualization activities, and the like must be kept in mind when control strategies are described and tested and when alternatives are selected. The mistake of delimiting practicable and desirable control strategies for a society that no longer exists must be avoided.

32961 **APTIC NO. 54387**

Hagevik, George

ADMINISTRATIVE PROCEDURES FOR INTRODUCING LAND USE PLANNING CONSIDERATIONS INTO AIR RESOURCE MANAGEMENT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1973. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 24-28, 1973, Paper 73-181.)*

The administrative procedures for relating land use planning to air resource management have as their basic objective increased communication between urban planners and air pollution control personnel. These procedures can be broadly categorized into those required by EPA or other Federal agencies and those developed with state or local initiative. At the Federal level, one finds the A-95 review, the environmental impact statement process under NEPA, the land use component of the air quality implementation plan, the complex source regulations of EPA, and emission density zoning. State and local procedures are less well defined and vary in application and utility. The best examples of such procedures are provided by the state of California, which is the only state to include land use planning as an element in its implementation plan. The Southern California Association of Governments requires the Los Angeles Air Pollution Control District to review applications for Federal water and sewer grants for the air pollution potential of the project the grant would support, and the California Air Resources Board reviews the highway proposals of the State Department of public works. The San Francisco Bay Area APCD has added an urban planner to its staff, while the Ventura County APCD is critically concerned with land use. (Author abstract modified)

32962 **APTIC NO. 54617**

Hammer, Rebecca W.

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS AFFECTING THE ENVIRONMENT. AVAILABILITY OF EPA COMMENTS. *Federal Register, 38(180):26148-26151, Sept. 18, 1973.*

Notice is given that the Environmental Protection Agency has reviewed and commented on in writing Federal agency various actions impacting the environment; these actions are summarized in five appendices. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing during the month of Aug. 1973. Appendix II contains the definitions of the classifications of EPA s comments on the draft environmental statements as set forth in Appendix I. Appendix III contains a listing of final environmental impact statements reviewed and commented upon in writing during August 1973. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon in writing pursuant to section 309(a) of the Clean Air Act, as amended, during Aug. 1973. Appendix V contains a listing of the names and addresses of the sources for copies of EPA comments listed in Appendices I, III, and IV.

32963 **APTIC NO. 54197**

Jingi, Giichi and Masaaki Naito

A SYSTEM TECHNOLOGICAL APPROACH TO ENVIRONMENTAL CONTROL. *(Kankyo seigyo ni taisuru shisutemu kogakuteki apurochi). Text in Japanese. Nippon Kikai Gakkai shi (Journal of the Japanese Society of Mechanical Engineers) (Tokyo), 76(659):1245-1251, Oct. 1973. 8 refs.*

An environmental pollution control study by the Japanese Ministry of Education is described. Main studies of air and water pollution, noise and vibration, and solid wastes are accomplished using data processing, modeling, planning, and total system technology. By comparing the objectives and methodologies for study subjects, 13 study groups were formed for the analysis and modeling of air diffusion processes, the estimation of water quality and control of water quality, and the control of the amount of water in environmental control.

32964 **APTIC NO. 54738**

Kurtzweg, Jerry A.

URBAN PLANNING AND AIR POLLUTION CONTROL: A REVIEW OF SELECTED RECENT RESEARCH. *AIP J., 39(2):82-92, March 1973. 43 refs.*

Many of the interrelationships between air quality and the intensity and spatial distribution of human activity, on a metropolitan and smaller scale, are currently not well delineated. Several studies have been initiated to identify at least some of these interrelationships. Two of these studies are concerned with air pollution as a metropolitan problem. In the first, zoning plans that limit emission density are proposed as a way of integrating metropolitan air pollution control and land use planning. In the second, a mathematical dispersion model is developed for use in estimating carbon monoxide concentrations at any location in a metropolitan area. In a third study, which is submetropolitan in scale, methods are developed for forecasting the air pollution potentials of alternative plans and for evaluating the relative desirabilities of the plans once their air pollution potentials have been estimated. A major element in all of these studies is the development and use of mathematical models describing the generation and dispersion of air pollutants. Two project scale studies have also been initiated: in the first, the effect of the configuration of a roadway on air pollutant concentrations is evaluated; and in the second, an analysis is made of the effect of building design and structural characteristics on indoor air quality. Before the results of many of these and similar studies can be translated into procedures for routine use by planning organizations, their general applicability will have to be tested. Federal legislation and policies are mentioned. (Author summary modified)

32965 **APTIC NO. 54460**

Mel nik, M. N.

FUNDAMENTAL PROBLEMS OF SANITARY SCIENCE AND PRACTICE IN CONNECTION WITH THE DEVELOPMENT OF INDUSTRY IN THE UKRANIAN SSR AND WAYS OF SOLVING THEM. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Silver Spring, Md., American Institute of Crop Ecology, Vol. 19, 1973, p. 14-16, APTD-1366, Translated from Russian. (Also: Zdorovya, 1969:5-12, 1969.)*

NTIS: PB 214264

An extensive network of sanitary epidemiological institutions has been created in the Ukranian Republic, and there are ten scientific research insitutions concerned with sanitation and hygiene. Approximately 7000 physicians and scientists are working in these areas. Appropriations are allocated every year to the implementation of atmosphere protection controls. In the last few years, 200 gas and dust purification installations have been constructed, and hundreds of industrial plants have been converted to gas operation. Successful implementation of sanitary protection measures have had positive effects upon the economic indices of the enterprise. It is now necessary to direct the attention of scientific, technological, and planning institutes to the development of methods for recovering and reutilizing chemical substances.

32966 **APTIC NO. 54966**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS. AVAILABILITY OF ENVIRONMENTAL PROTECTION AGENCY COMMENTS. *Federal Register, 38(195):27955-27957, Oct. 10, 1973.*

The Environmental Protection Agency (EPA) Manual which sets forth the policies and procedures for the EPA review of agency actions is summarized. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon. Appendix II contains the definitions of the classifications of the EPA comments on the draft environmental impact statements as set forth in Appendix I. Appendix III contains a listing of final environmental impact statements reviewed and commented upon. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon pursuant to section 309 (a) of the Clean Air Act, as amended, during the referenced reviewing period. Appendix V contains a listing of the names and addresses of the sources for copies of EPA comments listed in Appendices, I, III, and IV.

32967 **APTIC NO. 54184**

Miki, Takeo

PARTIAL REVISION OF REGULATIONS RELATIVE TO THE APPLICATION OF THE AIR POLLUTION PREVENTIVE LAW. *(Taiki osen boshi shiko kisoku no ichibu kaisei). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 8(5):86-90, Sept. 1973.*

Various air pollution regulations in Japan have been revised. These are related to the driving force of a pump, the number of facilities in a factory, the amount of consumption, the exhaust gas temperature, and the oxygen concentration in the exhaust gas. The amount of ashes, sulfur, and nitrogen in fuels has been revised. Lead and its compounds and nitrogen oxides have also been given revised standards. The amounts of cadmium, sulfur, lead, or nitrogen in fuels have been revised.

32968 **APTIC NO. 54849**

Mueller, K.

INTEGRATION OF ENVIRONMENTAL PROTECTION INTO THE EVALUATION OF PROGRAMS FOR LONG-TERM DEVELOPMENT UNDER THE ASPECT OF GROWTH THEORY. *(Einbeziehung des Umweltschutzes in die Bewertung von Varianten der langfristigen Entwicklung unter wachstumstheoretischem Aspekt). Text in German. Technik (Berlin), 28(8):526-530, Aug. 1973. 12 refs.*

The future development of processes and technologies may not be planned without full evaluation of all environment polluting aspects, in fact developments of new processes and restoration of the environment must go hand in hand. Each new process must be evaluated concerning its polluting effect. A scale can be used for expressing the pollution effect in numerical values. An example for such a scale is given. That version of a process with the lowest value is the least polluting one. The effective pollution is brought into relation with legally required limit values or acknowledged tolerance values. At the selection of a process version the expenditures with which any pollution is avoided must be calculated. The expenditures for the prevention of pollution must be distinguished from the expenditures for the elimination of environmental damages caused by pollutants. An equation for calculating the total expenditures in the case of power production is given. The equation includes the following parameters: investment costs for procuring the fuel, investment expenditures of the power consumer, investments for the prevention of environmental pollution (high stacks and filters), operating costs for power generation, operating costs of the power consumer, operating costs for combating environmental pollution, depreciation time, accumulation factor and consumption factor.

32969 **APTIC NO. 55291**

Nakano, Michio

HISTORY OF AND COUNTERMEASURES AGAINST ATMOSPHERIC POLLUTION. *(Taiki osen to sono taisaku no suii). Text in Japanese. Setsubi to Kanri (Install. Maint.), 7(7):47-55, July 1973. 5 refs.*

The history of air pollution in several countries, including Japan, is discussed. Pollution sources include forging, pig iron production, petroleum refining, and automobiles. Severe smog in London lead to establishment of the Clean Air Act. Rapid industrialization in Japan caused widespread pollution. Statistics are given for the annual consumption of energy/sq km of land and for the number of cars/sq km of land in Japan. Japanese air quality data is given for falling dust, sulfur oxides, and floating particulates. Air pollution was the worst in 1970 before pollution countermeasures were taken. Legal regulations and monitoring programs in Japan have helped reduce pollution.

32970 **APTIC NO. 54374**

Quarles, John

APPROVAL AND PROMULGATION OF COMPLIANCE SCHEDULES. *Federal Register, 38(173):24333-24342, Sept. 7, 1973.*

The approval and promulgation of 462 implementation plan compliance schedules for individual air pollution sources in the State of Florida are presented. All of the schedules are consistent with the substantive requirements of 40 CFR Part 51 that pertain to compliance schedules. They have also been determined to be consistent with the approved control strategies for the State of Florida. Each schedule was adopted by the State after a public hearing and reasonable notice in accordance with the procedural requirements of 40 CFR Part 51. Schedules for Alaska, Colorado, District of Columbia, Florida, Idaho, Illinois, Maryland, Michigan, New York, Oregon, South Carolina, Tennessee, Washington, West Virginia and Wisconsin were amended. Federal compliance schedules for Tennessee are discussed.

32971 **APTIC NO. 54385**

Quarles, John

CONTROLS APPLICABLE TO MOTOR VEHICLE MANUFACTURERS. *Federal Register, 38(183):26449-26450, Sept. 21, 1973.*

The EPA has reconsidered regulations promulgated on Jan 10, 1973 prescribing certain labeling and gasoline filler inlet design requirements applicable to motor vehicle manufacturers. The regulations required that a vehicle which requires the use of unleaded gasoline be labeled Unleaded Gasoline Only both on the instrument panel and on the area adjacent to but outside the gasoline filler inlet compartment. The EPA concludes that such labeling requirements are necessary, but has decided to add a provision that alternative modification schemes may be approved if determined to fulfill the purposes of this requirement. The regulations also required that unleaded fuel nozzles have outside diameters no greater than 0.85 inches, and that leaded nozzles have outside diameters no smaller than 0.93 inches; manufacturers were also required to equip catalyst controlled vehicles with nozzle restrictors no greater than 0.91 inches in inside diameter which would activate the automatic shut-off of nozzles with diameters greater than 0.84 inches. EPA has revised the regulations to require that the insertion of a nozzle with a diameter greater than 0.93 inches would be prevented and the attempted filling with such a nozzle would activate the automatic shut-off on that nozzle. Further, the original regulation has been modified to require the design of the filler inlet to activate the automatic shut-off of a standard nozzle to allow a maximum of 700 cu cm of fuel to be delivered into the vehicle fuel tank per attempt. A notice of proposed rule making, public comment, and postponement of effective date in the issuance of these amendments has been omitted as unnecessary and impractical.

32972 **APTIC NO. 54404**

Quarles, John

WASHINGTON STATE. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS; CORRECTION. *Federal Register, 38(182):26390, Sept. 20, 1973.*

In regulations proposed on July 16, 1973, for preconstruction review of parking facilities in the Seattle and Spokane areas of Washington State, a permit for the construction, modification, or enlargement of any parking facility was proposed to be required after the effective date of this regulation (Aug. 15, 1973). Although a revised court order states that the promulgation of final transportation control requirements for affected states will now be required by Oct. 15, 1973, EPA still requires that the proposed regulations be applicable to all construction, modification, or enlargement commenced after Aug. 15, 1973.

32973 **APTIC NO. 54580**

Quarles, John

APPROVAL AND PROMULGATION OF COMPLIANCE SCHEDULES. *Federal Register, 38(163):22736-22753), Aug. 23, 1973.*

Compliance schedules, stating the dates by which specified actions are to be taken by an air pollution source toward meeting applicable emission limiting regulations, are presented for the states of Alaska, Colorado, District of Columbia, Florida, Idaho, Illinois, Maryland, Michigan, New York, New Hampshire, Oregon, Rhode Island, Tennessee, Washington, West Virginia, and Wisconsin. States which have revised or are expected to revise regulations which are presently part of the implementation plan have been granted additional time for meeting the first increment, in order to allow them to make the necessary changes to the applicable implementation plan before sources need to take any action based on the present plan. Also, it has been determined that one year is a reasonable period of time to specify as a minimum length of a contract for fuels required. Changes made in the sulfur oxides compliance schedules include the rewording of any facility to any boiler or furnace.

32974 **APTIC NO. 54569**

Quarles, John R., Jr.

USE OF SUPPLEMENTARY CONTROL SYSTEMS AND IMPLEMENTATION OF SECONDARY STANDARDS. PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS. *Federal Register, 38(178):25697-25700, Sept. 14, 1973. 3 refs.*

Amendments to 40 CFR, Part 51 are proposed for allowing selective use of supplementary control systems as a means of attaining and maintaining the national ambient air quality standards in cases where permanent production curtailment, shutdown, or delays in attainment of the national standards are the only other alternatives. Although the use of stack heigh up to the level of good engineering practice is encouraged by the Environmental Protection Agency, extensions of stack height beyond that of good engineering practice will not be credited as an acceptable portion of an air pollution control strategy unless the extension is accomplished as part of an approved supplementary control system. The definition of reasonable time for the attainment of secondary standards is proposed for modification to the time required to design, fabricate, and install reasonably available control technology, as defined in Appendix B to the State plan guidelines (40 CFR Part 51). More stringent requirements are proposed for future demonstrations of attainment and maintenance of standards for particulate matter and sulfur dioxide. Diffusion modeling would be required for use in estimating maximum concentration unless it was shown to be inappropriate.

32975 **APTIC NO. 54511**

Sansom, Robert

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. NOTICE OF OPPORTUNITY FOR PUBLIC COMMENT ON PLANS TO ACHIEVE SECONDARY STANDARDS. *Federal Register, 38(170):23823, Sept. 4, 1973.*

Plans to achieve secondary standards for particulate matter in the New York portion of the New Jersey-New York-Connecticut Interstate Region and the Central New York and Niagara Frontier Intrastate Regions are presented. The plan proposes to reduce particulate emissions through application of the following additional measures in the Metropolitan New York City area: lower emission limitations for new and modified nonutility combustion; reduction of gasoline powered motor vehicle travel by 40%, as proposed in the New York Transportation Control Plan; elimination of onsite incineration; and widespread energy conservation measures. No new control measures are proposed for the Central New York and Niagara Frontier Regions. Instead, the control strategy is based on revised emissions data and more recent air quality data. In Niagara County, the plan proposes reduction of particulate emissions from sources in Candaa, prohibition of construction of new sources, and reduction of emissions from graphitizing operations when appropriate control technology becomes available. The attainment date for the secondary particulate matter standards for all three Reigons is 1995.

32976 **APTIC NO. 54749**

Sansom, Robert L.

NATIONAL AIR POLLUTION MANPOWER DEVELOPMENT ADVISORY COMMITTEE. *Federal Register, 38(180):26151, Sept. 18, 1973.*

Notice is given that the Training Priorities Subcommittee Meeting will be held on September 17, 1973 to prepare a paper on Goals and Training Priorities. On September 27, 28, and 29, 1973, the National Air Pollution Manpower Development Advisory Committee will meet to review this paper and fellowship applications and to hear presentations from the University of Illinois. The meeting will be open to the public.

32977 **APTIC NO. 54863**

Sansom, Robert L.

METROPOLITAN BALTIMORE STATE INTRASTATE REGION PLANS. OPPORTUNITY FOR PUBLIC COMMENT ON PLANS TO ACHIEVE SECONDARY STANDARDS. *Federal Register, 38(180):26151, Sept. 18, 1973.*

The Governor of Maryland has submitted a plan to attain and maintain the secondary standard for sulfur oxides in the Metropolitan Baltimore Instrastate Region. Notice is issued to advise the public that comments may be submitted on whether the control strategy should be approved or disapproved as required by section 110 of the Clean Air Act. The proposed plan does not alter or supplement the present Maryland regulations for sulfur dioxide. Rather, it is submitted to demonstrate that the implementation and enforcement of existing Maryland Regulations in the Baltimore region will be sufficient to achieve the secondary standards for sulfur dioxide by 1975. Copies of the plan are available for public inspection at locations in Philadelphia, Baltimore, and Washington, D. C.

32978 **APTIC NO. 55158**

Smith, Franklin and A. Carl Nelson, Jr.

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM. REFERENCE METHOD FOR MEASUREMENT OF PHOTOCHEMICAL OXIDANTS. (INTERIM REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-0598, EPA-R4-73-028c, Program Element 1H1327, 112p., June 1973. 6 refs.*

NTIS: PB 222336

Guidelines for the quality control of the Federal reference method for continuous measurement of photochemical oxidants by chemiluminescence are presented. These include: good operating practices, directions on assessing and qualifying data, directions on identifying trouble and improving data quality, directions to permit design of auditing activities, and procedures which can be used to select action options and relate them to costs. The document is designed for use by operating personnel and is not a research report. It includes operations, calibration, supervision, and management manuals.

32979 **APTIC NO. 55192**

Smith, Franklin and A. Carl Nelson, Jr.

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM. REFERENCE METHOD FOR THE CONTINUOUS MEASUREMENT OF CARBON MONOXIDE IN THE ATMOSPHERE. (INTERIM REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-0598, Program Element 1H1327, EPA-R4-73-028a, 124p., June 1973. 7 refs.*

NTIS: PB 222512

Guidelines are presented for implementing a quality assurance program for the continuous measurement of carbon monoxide in the atmosphere using non-dispersive infrared (NDIR) spectrometry. The guidelines include: directions on assessing and qualifying data; calibration methods; directions on identifying trouble and improving data quality; good operating practices; directions to permit design of auditing activities; and procedures which can be used to select action options and relate them to costs. The document is designed for use by operating personnel and is not a research report. (Author abstract modified)

32980 **APTIC NO. 54491**

Train, Russell E.

CALIFORNIA AND OREGON. IMPLEMENTATION OF STATE PLANS; OPPORTUNITY FOR PUBLIC COMMENT. *Federal Register, 38(183):26462-26463, Sept. 21, 1973.*

A notice is issued to advise the public that the state of California has submitted a Revision 3 to the State General Plan for the control of photochemical oxidants and to the plans for San Francisco, San Diego, San Joaquin, and Sacramento, and that the state of Oregon has submitted supplemental information for the Portland region. California s Revision 3 contains a regional transportation plan which was prepared by the Metropolitan Transportation Commission. A letter from the governor of the state requests extensions until 1977 of the attainment dates for the photochemical oxidant standard in the San Diego, San Franciso, and Sacramento regions, and for the carbon monoxide standard in the Sacramento region. The supplemental document for Oregon consists of the following sections: Motor Vehicle Inspection/Maintenance--Retrofit Program; Traffic Flow and Mass Transit Improvement Programs; and five appendices. On August 15, 1973, the state Legislative Emergency Board approved an expenditure of $1,000,000 to begin implementation of the vehicle inspection program.

32981 **APTIC NO. 54964**

Train, Russell E.

REGULATION OF FUELS AND FUEL ADDITIVES. PROPOSED RULEMAKING CONCERNING AVAILABILITY OF UNLEADED GAS. *Federal Register, 38(197):28301-28302), Oct. 12, 1973.*

A proposal to amend Part 80 of Chapter 1, Title 40 of the Code of Federal Regulations is presented. The Amendment would revoke paragraph (c) in 80.22 which requires that every owner or operator of six or more retail outlets shall offer for sale at least one grade of unleaded gasoline at no fewer than 60% of such outlets after July 1, 1974. Several members of the petroleum industry petitioned for review of the availability requirements requesting that paragraph (b) (which requires that every owner or operator of a retail outlet at which 200,000 or more gallons of gasoline were sold during any calendar year beginning with 1971 offer at least one grade of unleaded gasoline) as well as (c) be revised to reduce the number of retail outlets obligated to offer unleaded gasoline in light of possibly decreased demand for the unleaded fuel. The Environmental Protection Agency reexamined the availability provisions with particular attention to the geographic dispersion afforded by the present and alternative requirements. The 160,000 stations selling over 200,000 gallons per year represent 45% of the branded retail outlets, sell over 2/3 of the gasoline in the country, are widely dispersed geographically, and assure the general availability necessary for use in vehicles equipped with catalysts. Paragraph (c) may therefore be deleted, but paragraph (b) must be retained as the sale availability requirement for unleaded gasoline.

1972

32982 **APTIC NO. 54292**

Council on Environmental Quality

ENVIRONMENTAL QUALITY. THIRD ANNUAL REPORT. *473p., 1972. 681 refs.*

GPO

The environmental conditions of society and the need for indices of environmental quality and forecasting, the costs and impact on the economy of pollution control requirements, and the effects of environmental standards on international trade are discussed. The data indicate that the quality of the air in many cities is improving. Federal, state, and municipal regulations, plans, and legislation from improving air quality are presented. The rapid step by step progress in institutionalizing and reorganizing the Federal environmental structure, the dramatic increase in funding, a wide range of administrative actions, strict enforcement of pollution control laws, new international agreements, and a broad array of major new legislation which was submitted to Congress, are discussed.

32983 **APTIC NO. 54455**

Organisation for Economic Co-operation and Development, Paris (France)

CO-OPERATIVE TECHNICAL PROGRAMME TO MEASURE THE LONG RANGE TRANSPORT OF AIR POLLUTANTS. *12p., June 1, 1972.*

A 3-year program was set by the Organisation for Economic Co-operation and Development (O.E.C.D) to determine the relative importance of local and distant sources of sulfur compounds in terms of their contribution to air pollution over a region; special attention was given the question of acidity in atmospheric precipitation. The program is divided into four phases: a preparatory phase in which standardized procedures and operational manuals are to be developed; a pilot measurement phase in which the general approach will be tested, a first set of data collected, and sampling and analysis methods tried out; a second measurement phase in which the results obtained in the pilot phase will be confirmed and additional data collected to determine the scale and effects of the long-range transport of air pollutants; and a concluding phase in which the analysis will be completed, the data interpreted, and a report drawn up. The program will make use of ground stations, aircraft sampling, emission surveys, and central data evaluation. The administrative machinery will consist of a steering committee made up of representatives of the 14 participating countries, and a central coordinating unit, which will coordinate work on the program, ensure comparability of results, and collate and interpret data. Close links will be maintained with the O.E.C.D. s Air Management Sector Group and other international organizations, including the World Meteorological Organization and Nordforsk. Each participating country will assume the costs associated with its own ground stations, air sampling operations, and sample analysis. The costs involved in the work done by the Central Co-ordinating Unit will be shared among the participating countries. Guidelines for the location of the ground stations are presented.

32984 **APTIC NO. 55057**

Alvarez, Ronald J.

SOLID WASTE DISPOSAL TRAINING PROGRAMS. *American Society of Mechanical Engineers, New York, Proc. Natl. Incinerator Conf., New York, 1972, p. 1-10. 2 refs. (June 4-7.)*

A Solid Waste Disposal Training program was developed over the past several years in Long Island. The current program, first offered in June 1971, consists of curricula in basic and advanced incinerator technology and sanitary landfill operation. Each curriculum offers courses in administration and personnel management, pollution control, economics, and equipment selection and maintenance. The program has the sanction and support of various technical and professional societies and local and state health officials. The instructional staff consists of experts in the solid waste fields and members of the Engineering Science Department at Hofstra University. Courses pertaining to air pollution technology deal with fly ash collection, heating, ventilation, chimneys, stacks, air pollution control, and basic plant design with reference to air, fuel, and heat release.

32985 **APTIC NO. 54669**

Barnes, Dennis W.

SCIENCE, TECHNOLOGY AND STATE POLICY-ENVIRONMENTAL QUALITY IN VIRGINIA. (FINAL REPORT). *Virginia Univ., Charlottesville, Center for the Study of Science, Technology, and Public Policy, National Science Foundation Grant GT-2, 57p., June 1972.*

The development of an effective role for higher education in environmental planning and problem-solving in Virginia was explored. The air pollution summer program was concerned with assisting the evaluation of the legislative authority under which the State Air Pollution Control Board operates, with a view toward studying specific legislative proposals designed to increase the effectiveness of the Board in assuring adequate air quality management within the Commonwealth. The second goal was an internal review of Board-Staff policies and operations and probable future legislation with a view toward devising administrative procedures and recommendations designed to promote increased efficiency and accommodate anticipated growth of the agency s size and responsibilities.

32986 **APTIC NO. 54734**

Collins, David C., William S. Meisel, and Michael D. Teener

TRAFFIC RESTRICTIONS FOR AIR POLLUTION CONTROL, A PILOT STUDY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1972. 13 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami Beach, Fla., June 18-22, 1972, Paper 72-58.)*

Multiple criteria evaluation was used to study the trade-off between pollutant reduction and the inconvenience/enforcement cost of a traffic control strategy involving the penalization of single-occupant vehicles. The elements of the overall model constructed include: a freeway traffic model which estimates the impact of the control policy on the generation of raw pollutants by traffic; a dynamic photochemical smog model which relates diurnal variations in raw pollutant rates and meteorological conditions to diurnal variations in hydrocarbons, nitrogen oxides, and oxidants; a measure of the cost of air pollution in terms of peak 1-hour averages of ozone; a measure of costs of control in terms of inconvenience to the public and the cost of enforcement; and a feedback control rule which relates current oxidant levels to the amount of traffic restriction to be applied the following day. Study of the policy was made possible by utilizing the techniques of multiple criteria optimization. The multiple criteria methodology is easily feasible for complex models and it provides a valuable air for evaluating the spectrum of possible effects of the traffic restriction policy. For a city with conditions similar to those in Los Angeles after pollution levels are reduced by one half, further improvement comes only with considerable increases in inconvenience cost. Peak pollutant levels decreased almost linearly with the inconvenience cost up to a 25% reduction. The noninferior control laws were those which resulted in a steady but reduced level of pollutants from day. The approach was a feasible, but uncomfortable, interim solution to a pollution crisis. (Author abstract modified)

32987 **APTIC NO. 54842**

Kirkpatrick, Lane

A REPORT BY THE NEHA AIR POLLUTION COMMITTED TRANSPORTATION PLANNING. *J. Environ. Health, 34(6):629, May-June 1972.*

Nineteen states have decided that, at least for urban centers, vehicle usage should be controlled and transportation planning used to reach publicly acceptable levels of air quality and meet the 1975 Federal ambient air quality standards. The controlling measures include traffic control, parking restrictions, retrofit systems, testing and inspection, gaseous fuel systems, and improved public transportation and work schedule changes. Inspection, maintenance, and retrofitting of cars can cut automotive emission levels by 10-25%. Traffic flow techniques may reduce automotive emission levels by up to 20%, but these techniques appear to be useful in decreasing air pollution for only the year immediately following implementation; emissions after this period could increase above original levels due to increased traffic volumes. Improvements in public transportation are concluded to be capable of reducing motor vehicle emissions by only 5%. It is suggested that environmental officials try to coordinate air pollution control objectives with regional transportation authorities, planning boards and councils, city and county commissioners, state legislators, and Congress since no air pollution control agency has legal authority to implement adequate transportation controls.

32988 **APTIC NO. 55026**

Lanteri, Annemaree

ENVIRONMENT PROTECTION ACT 1970 (VICTORIA). *Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 134-138. 41 refs. (May 15-18.)*

The Environmental Protection Act 1970 for Victoria aims at a radical approach to legislative control of pollution and may provide a model for action by other States. Its scheme is to co-ordinate control of all forms of pollution under a central authority and to use existing bodies already charged with duties in this field as supplementary enforcement organs. The penalties imposed under the Act are quite stringent, and it provides for the strict licensing of any discharge of waste into the environment. The effectiveness of the scheme will largely depend upon the financial support afforded its administrators by the State Government. (Author abstract)

32989 **APTIC NO. 55079**

Stairmand, C. J.

THE COST OF AIR POLLUTION CONTROL - CAN WE DRAW A BALANCE SHEET? Clean Air Society of Australia and New Zealand, Proc. Int. Clean Air Conf., Melbourne, Australia, 1972, p. 120-127. (May 15-18.)

A review of the cost of air pollution control in the United Kingdom leads to the conclusion that complete elimination of all emissions is too enormously expensive to be considered as a practicable possibility. The aim, rather, should be to control emissions so that they no longer constitute a nuisance or a danger. Tolerable additions of emissions from new plants should be limited to about 10 to 20% of those already existing, and it should not be considered unreasonable to spend 5 to 10% of the total capital and/or running cost on pollution-control measures, with figures up to 20% being reasonable where the problems are particularly difficult. The basis of pollution control measures should be to limit the effects on amenities rather than to limit the national or global emission of a particular pollutant. The United Kingdom s annual expenditure for pollution-control measures amounts to nearly $130 million, which is about 0.2% of its Gross National Product. A list of presumptive standards for emissions from various industrial sources set by the United Kingdom Alkali Inspectorate is provided as a guide to limits which have been found to avoid most of the gross pollution problems experienced in early industrial developments.

1971

32990 **APTIC NO. 54844**

Gustafson, S. A. and K. O. Kortanek

ON THE NUMERICAL DETERMINATION OF OPTIMAL CONTROL STRATEGIES FOR AIR QUALITY STANDARDS AND REGULATORY POLICY. *Carnegie-Mellon Univ., Pittsburgh, Pa., Inst. of Physical Planning, Research Rept. 22, 29p., Aug. 1971. 40 refs. (Presented at the German Operations Research Society, 10th Annual Meeting, Bochum.)*

NTIS: PB 207975

A mathematical model is presented for obtaining optimal air pollution control strategies with minimal economic impact of implementation. The task is to optimize under an infinite number of constraints for the requirement that the concentration of pollutants at every point of a given region must be below prescribed levels. The conditions of the problem can be combined to a system of nonlinear equations from whose solutions an optimal vector of the problem can be found; the Newton-Raphson s method should be used for solving the nonlinear system. The system converges quadratically, provided a sufficiently good initial approximation is given and the system possess certain regularity properties. An example is presented involving a company with three plants emitting pollutants from elevated sources which must comply with city ordinance standards. The analytical statement that the company comply with the city ordinance involves one linear inequality for each point in the region, and the problem is to reduce the infinite number of inequalities to a finite number. This hypothetical example is computed via the model with three linear constraints binding and hence three receptor points needed to check compliance throughout the region. The scheme presented leads to the construction of a solution passing the descrepancy and non-optimality tests after a finite number of operations, under the assumption that all operations are carried out with sufficiently good accuracy.

32991 **APTIC NO. 54662**

Kinosian, John R.

STATE AIR MONITORING NETWORK. *Preprint, American Society for Metals and Society of Manufacturing Engineers, 12p., 1971. (Presented at Western Metal and Tool Conference and Exposition, Los Angeles, Calif., March 8-11, 1971, Paper W71-19,3.)*

To resolve the problems posed by California s current air monitoring program, the state s Air Resources Board will use the funds provided by Assembly Bill 87 to establish and support a basic statewide air monitoring network. The location, distribution, and number of stations in the basic network is based on the following criteria: each of the 14 standard metropolitan statistical areas of the state must have at least one permanent station; each of the 11 air basins must have at least one station, plus an additional station for each million population; each basin that is of predominant importance in the raising of crops and that has a severe smog potential based on considerations of population growth, meteorology, and topography, or where gaseous pollutants have frequently exceeded the air qualtiy standards, shall have at least one station for each 5000 sq mi of land area; every country in either the South Coast or Bay Area Air Basins must have at least one station; and every local or regional agency that has a continuous air monitoring program will receive financial support for at least one station. A basic network of 35 stations will thus be established; no stations are required under the fifth criterion at this time. Each station will continuously monitor oxidants, nitrogen dioxide, nitric oxide or oxides of nitrogen, hydrocarbons (other than methane), carbon monoxide, and suspended particulates; sulfur dioxide will be monitored in areas where it is a significant pollutant. Twenty of the stations will be maintained and operated by the Air Resources Board and 15 will be operated by air pollution control districts with funds provided by AB 87.

32992 **APTIC NO. 55175**

Teich, Alfred H., Phillip H. Howard, and LeeAnn Sumnicht

ENVIRONMENTAL RESEARCH LABORATORIES IN THE FEDERAL GOVERNMENT. AN INVENTORY. (VOL. I). *Syracuse University Research Corp., New York, Policy Inst., National Science Foundation Grant GI-35, 472p., Sept. 1971.*

NTIS: PB 209 751

Existing in-house capabilities for environmental research in the Federal Government are described. This inventory makes available relevant information on the capabilities of Federal laboratories, develops a statement about environmental research needs to compare with the facilities represented, stimulates closer ties between laboratories of diverse Federal agencies, and is of value to scholars in public administration, political science, and science policy. Each laboratory is identified as to name, agency, and location. Its magnitude is calculated in reference to budget, personnel, and physical plant. Its mission, history, budgetary trends, details of personnel structure, organization, special resources, and modes of communication are described. Major environmental programs and future plans are outlined. Data was collected by requesting annual reports, brochures, reprints, statements, and other pertinent material from each laboratory. Air quality research programs are indicated, and differentiated among the categories of measuring and monitoring pollutants, prevention and control of pollutants, and evaluation of effects of pollution.

1970

32993 **APTIC NO. 54675**

Radzimirski, S.

REGULATIONS LIMITING THE AUTOMOTIVE EXHAUST EMISSIONS. *(Przepisy ograniczenia emisji spalin samochodowych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 4(3):1-8, 1970. 2 refs.*

NTIS: TT 70-55124-3

United States and European regulations limiting automotive exhaust emissions are reviewed. Limitations on carbon monoxide and hydrocarbon emissions from the exhaust system, hydrocarbon emissions from the fuel feed system and crankcase emissions of spark engines, as well as the smokiness of the exhaust of compression ignition engines are presented. In Europe the pollution of air caused by automobiles is not as drastic as in California. In certain large cities the level of noxious compounds in air exceeds the permissible figures, and authorities are taking adequate preventive measures. The first step was the establishment of a standard setting a maximum to the smokiness of exhaust emissions for compression ignition engines. Requirements for reducing HC emissions from the crankcase were established. In France, the maximum permissible emission of HC may not exceed 0.15% on the consumed fuel. Work is also in progress throughout Europe to lower air pollution due to the automotive exhaust system emissions, the principal source of noxious compounds. The emission of carbon monoxide will be limited during the idle run of the engine to about 4.5% by volume. Following the California pattern, as automobile operation cycle was developed, according to which the measurements will be taken. This cycle differs from the American one in view of the different street traffic volume in European cities. The limitation of CO emissions to 100 g/cycle is anticipated.

1967

32994 **APTIC NO. 54288**

Dept. of Health, Education, and Welfare, Washington, D. C., Public Health Service

THE CLEAN AIR ACT. DECEMBER 17, 1963 (PUBLIC LAW 88-206). AS AMENDED OCTOBER 20, 1965 (PUBLIC LAW 89-272). OCTOBER 15, 1966 (PUBLIC LAW 89-675). *90th Congress, 16p., 1967. (Also: Grain and Feed Dealers National Assoc., Proc. Nat. Symp. Air Pollution, D. C., 1967. (Jan. 11-12).)*

GPO

This act improves, strengthens, and accelerates programs for the prevention and abatement of air pollution by encouraging cooperative activities and uniform laws among State and local governments; instituting a national research and development program; and offering finanical support to air pollution control programs. Enforcement of abatement procedures is described. The Motor Vehicle Air Pollution Control Act is contained in the Clean Air Act and includes prohibited acts. injunction proceedings, penalties, certification, and records and reports. The administration of this act is also outlined.

32995 **APTIC NO. 54291**

Hubbard, Robert F.

STUDY OF DUST EMISSION LEVELS AND CONTACT WITH LOCAL AIR POLLUTION AGENCIES. *Grain and Feed Dealers National Assoc., Proc. Nat. Symp. Air Pollution, Washington, D. C., 1967, p. 61-63. (Jan. 11-12).*

GPO

Loading, drying, cleaning, and transferring operations in the grain industry should be calculated to quantify dust emission amounts. Priorities should then be assigned, according to severity and location of problem. When a control program is instituted, the public should be kept aware of advances. Involvement with current legislative action is suggested. Returns can be calculated in terms of public relations and economic savings. Contact with the local air pollution control agency is politically and technically beneficial.

32996 **APTIC NO. 54289**

Keating, William J.

AIR POLLUTION AS SEEN BY THE INDUSTRY. *Grain and Feed Dealers National Assoc., Proc. Nat. Symp. Air Pollution, Washington, D. C., 1967, p. 37-38. (Jan. 11-12).*

GPO

Some examples of the immediacy of air pollution problems in the grain industry are given, with particular reference to community relations. Legislative steps to facilitate air pollution control programs are discussed in terms of benefit to both the community and the businessman. These include a law which would exempt air pollution control equipment from the suspension of investment tax credit, and several other bills in the area of taxation with would allow the grain industry to write off expenditures for air pollution control equipment in 1 to 5 years.

32997 **APTIC NO. 54727**

Shiffman, Morris A.

A SURVEY OF THE USE OF STANDARDS IN THE ADMINISTRATION OF ENVIRONMENTAL POLLUTION CONTROL PROGRAMS. *Pennsylvania Univ., Philadelphia, Pa., Dept. of Political Science, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1967, 314p. 143 refs.*

The description and analysis of the standards process in environmental pollution control are undertaken from the point of view of political scientists, social scientists, and economists. The administrative behavior of program administrators and specialists is related to their concept of the standards and their perception of the particular components of the standards process. Literature on administrative behavior is explored and then compared to the actual use of standards in the administration of environmental control programs. This information was gathered through interviews and questionnaire surveys of practitioners in these programs. The respondent s concept of the utility of standards is an aid in the day-to-day operational phases of the program, rather than the planning and supportive aspects. Program administrators are sensitive to the shortcomings of environmental health standards, but do not feel that these are disabling. There is a marked preference for the officially adopted standard, especially if it is the one accepted by one s own professional society. There was, however, a definite choice made for the governmental standard over any other type. There is often a conflict between the administrative role which depends upon regularization of procedures, and thus on standards, and the professional role which emphasizes individual judgement. The validity of individual standards is judged by the administrator s confidence in the source of the standard. A secondary factor was the respondent s knowledge of the expert committee members who developed the standard. Problems were found concerning overly rigid enforcement policies and contradictory standards arising from different sources. The respondent general concepts and opinions on current standards were formulated into preferences for specific attributes. This focus on attitudes and behavior in the implementation of such standards explores the origins of administrative behavior. (Author abstract modified)

32998 **APTIC NO. 54287**

Stern, Arthur C.

THE FEDERAL CLEAN AIR ACT: PURPOSES AND PROVISIONS. *Grains and Feed Dealers National Association, Proc. Nat. Symp. Air Pollution, Washington, D. C., 1967, p. 13-22. (Jan. 11-12).*

Several aspects of the Clean Air Act are discussed in order to illustrate the Federal government s commitment to a comprehensive national program of air pollution control. This effort is largely based on the premise that State and local governments will accept responsibility in the air pollution control field if they are given Federal assistance. There is ample provision for the formation of cooperative ventures at the regional, state, interstate, local, and industrial levels. Financial support is given in the form of basic research grants, training grants, maintenance grants, and survey and demonstration grants.

32999 **APTIC NO. 54290**

Tessmer, Ernest H., Jr.

GRAIN INDUSTRY COMMENTS ON THE DEVELOPMENT OF THE CHICAGO CODE OF RECOMMENDED PRACTICES FOR GRAIN HANDLING AND STORAGE. *Grain and Feed Dealers National Assoc., Proc. Nat. Symp. Air Pollution, Washington, D. C., 1967, p. 57-60. (Jan. 11-12).*

GPO

Modifications of the Chicago Code of Recommended Practices for Grain Handling and Storage requested by the representative of the grain industry are discussed. In section 2.0, the grain firms request the provision that the Department of Air Pollution Control limit its regulation to the actual supervisory measurement of emissions from the exterior of the building and to external investigation only when such emissions to the outside atmosphere exceed acceptable limits. In section 3.0, the minimum ventilation exhaust basis ob 0.35 grains/cu ft of exhaust gas is dropped and a phrase preventing the addition of diluting air downstream of any polluton control device is substituted. In section 4.2, more emphasis on the fact that installation permits and feed shall be applicable only to air pollution control equipment was requested. Section 5.0 deals with problem points are outlines possible solutions. The grain industry representatives requested that the work should be substituted for the word shall in some cases. This is to allow for individual adjustments, provided that they conform to emissions limitations. In section 6.3, it was recommended by the Department of Air Polluton Control they all cyclones be replaced with fibric filter dust collectors. A paragraph was inserted reiterating the point that there should be no restriction on any type of air pollution equipment which fulfills the emission limitation requirements.

SOCIAL ASPECTS

1972

33000 **APTIC NO. 54176**

Kobe City (Japan), Bureau of Environment

AN INVESTIGATION ON CONSCIOUSNESS OF ENVIRONMENTAL PROBLEMS IN THE CASE OF THE CITIZENS OF KOBE CITY. *(Kobe shimino o taisho to shita kankyo mondai ni tsuite no ishiki chosa). Text in Japanese. 20p., Nov. 1972.*

Adults were given questionnaires from Oct. 26 to Nov. 8 in 1972 in Kobe regarding their attitudes toward pollution. In 1972, 24.7% answering the questionnaire felt their residences were not in good environments, and 27.8% felt this way in 1971. In 1972, 77.6% were concerned about pollution, and in 1971, 85.7% were concerned.

33001 **APTIC NO. 54437**

Mason, Robert G.

EFFECTS OF AIR POLLUTION ON PUBLIC ATTITUDES AND KNOWLEDGE. *Oregon State Univ., Corvallis, Air Pollution Control Office Contract CPA 70-117, EPA-R5-72-007, 148p., June 1972. 54 refs.*

NTIS: PB 212739

Public attitude and knowledge about air quality were examined in two ways: first, by a hypothesis stating that perceived changes in air quality are defined or redefined, in part, by the local mass media and secondly, by a theoretical model concerning the communication of air quality information to the public. An empirical test of the mass media content-attitude change involved comparison of two daily newspaper contents and the results of random sampling in the respective communities. Weak, but positive, support was found for the definitional hypothesis. The communication model contained two sets of variables. Attitudes towards air quality, mass media exposure to information about air quality, level of air quality knowledge, and levels of interpersonal discussion were considered endogenous variables, while social influence, levels of formal and science education, use of the environment for recreation and the belief that air pollution was serious in the community were defined as exogenous. Empirical testing of this model involved personal, standardized interviews of randomly sampled individuals. Level of knowledge was an important basis for determining levels of attitudes. Air quality goals should be established on the basis of social feasibility as well as economics and technology; emission control programs should be based, in part, on the existence of an informed and supportive public; air pollution control authorities should become skilled in the use of applied behavioral science research; and additional research should be conducted to provide a more complete understanding of human reactions and behavior toward air pollution situations and control efforts.

33002 **APTIC NO. 54719**

Snyder, Phyllis, Marcia

AN INSTRUMENT TO APPRAISE STUDENT KNOWLEDGE, ATTITUDES AND PRACTICES RELATING TO ENVIRONMENTAL HEALTH. *California Univ., Los Angeles, Dept. of Health Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1972, 222p. 127 refs.*

A valid and reliable test was devleoped capable of appraising the knowledge, attitudes, and practices of college and high school students relating to certain environmental health issues. Concepts were formulated, factual material was outlined, instructional objectives were developed, a pool of items related to the objectives was constructed, items were evaluated by experts, a trial test was prepared and administered, the resultant data was analyzed by logical and statistical procedures to determine validity and reliability, and the final form of the test was constructed. This instrument is valuable for pretesting the baseline data for environmental education courses, acting as a pretest and post-test to evaluate environmental education courses, self-evaluation by students, demonstrating the need for environmental health education at the college and high school levels, and identifying areas of weakness in student knowledge about environmental health. (Author abstract modified)

GENERAL

1973

33003 **APTIC NO. 54887**

Kitsutaka, Hiroshi

ASSEMBLED SMOKESTACK EQUIPMENT. *(Shugo entotsu sochi). Text in Japanese. (Mitsubishi Heavy Industries, Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-13468. 2p., April 12, 1973. 2 refs. (Appl. June 13, 1968, 1 claim).*

An assembled smokestack which eliminates the downwashing phenomenon is discussed. The top discharge openings of several smokestacks are designed to touch upon one another at narrow intervals so that the exhaust gases from each smokestack can be discharged in one gas flow. Each discharge opening is provided with a sheltering plate projecting horizontally towards the outside of the stack so that each sheltering plate of each stack can adjoin one another at slight intervals. When a thermal expansion difference takes place between the stacks by a change in the operational conditions of each, the height of each discharge opening changes, and each sheltering plate correspondingly changes in height. When the wind blows in any direction, the exhaust gas from each discharge, the exhaust gas from each discharge opening is involved in a negative pressure produced at the back of the leeward side of the stack, and the downwashing phenomenon is prevented.

33004 **APTIC NO. 54393**

Tsang, Geb

FURTHER LABORATORY EXPERIMENTS ON A STACK OF OPTIMAL EXIT VELOCITY DISTRIBUTION. *Atmos. Environ., 7(7):755-762, July 1973. 1 ref.*

The performance of a new stack design was investigated in a laboratory in a neutral and in stably stratified atmosphere at various cross wind velocities. In the new design, the exit velocity was optimally distributed to ensure a minimal ambient air entrainment. Comparisons were made between the stack of new design and a conventional stack, under identical plant and atmospheric conditions. Experiments in a neutral ambient fluid showed that at cross wind velocity of 15.5 and 7 mi/hr, the additional plume rise fained by the plume from the stack of new design was 2.5 and 5 stack diameter, respectively. A higher additional plume rise was gained at a lower cross wind velocity. Experiments in stably stratified atmosphere showed that the plume from the stack of new design gave a higher plume rise and diffused better into the upper atmospheric layer. An undesirable wake was observed at the top of the stack of new design. A low velocity air jacket surrounding the flue gases is suggested as a means to eliminate or reduce this wake. (Author abstract modified)

33005 **APTIC NO. 54458**

Zil ber, D. A., R. A. Loginova, I. N. Novikova, A. I. Olekhovich, M. M. Ostrovskiy, and M. D. Razumovskiy

POLLUTION OF AIR WITH NOXIOUS CHEMICAL AND MECHANICAL IMPURITIES. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. Environmental Pollution with Special Reference to Air Pollutants and to some of their Biological Effects. M. Y. Nuttonson (ed.), Vol. 19, Silver Spring, Md., American Institute of Crop Ecology, 1973, p. 1-9, APTD-1366. Translated from Russian. (Also: Gigiena, 1970:36-46, 1970.)*

NTIS: PB 214264

Types and sources of air pollution are discussed in relation to their effects on human health and damage to plants, animals, and materials. Control and prevention measures are included. Noxious gases, such as sulfur dioxide are emitted from boiler rooms of electric and thermoelectric power plants, residential and public buildings, and industrial enterprises. Sulfur trioxide, a particular product of anthracite coal combustion, is an irritant to the mucous membranes of the upper respiratory tract and eyes. Carbon monoxide, emitted from motor vehicle, causes headaches and general discomfort, and higher concentrations in industrial conditions may cause severe damage to human health. Mechanical impurities, such as dust and smoke, are also found in the same areas. The atmosphere is polluted by aerosols fly ash, unburned coal particulates, and flue gases. Examples are given of humans suffering from disturbances of the nervous, respiratory, and pulmonary systems, along with carcinogenesis directly traceable to industrial emission sources. Effects of livestock, plants, and materials are noted. Decreases in visibility and solar radiation are also mentioned. The USSR is trying to counteract this situation with preventive legislation. A 1949 law forbids the institution of any commercial enterprise without emission control programs. A 1960 law charges committees, agencies, institutions, and other organizations with implementing air pollution control measures. The Soviet sanitary legislature has adopted two values of atmospheric pollutants, the highest one-time and mean daily concentrations, which may be used to measure air quality. The Soviet sanitary legislation is also organizing a zoning plan which would incorporate appropriate gaps between industrial facilities and residential areas.

1972

33006 **APTIC NO. 54902**

Kobayakawa, Takashi

FUTURE TRENDS AND THE HISTORY OF COUNTERMEASURES TAKEN AGAINST ATMOSPHERIC POLLUTION. *(Taiki osen taisaku no keika to kongo no hoko). Text in Japanese. Jidosha Kogyo (Automob. Ind.), 6(9):25-36, Sept. 1972.*

Carbon monoxide concentration in the air, pollution predicting systems, smog, CO standards, and CO control programs are discussed. Carbon monoxide is discharged from automobiles and various heating systems. Japanese government regulations have decreased CO emissions. The average annual CO concentration in Osaka was 4.8, 3.0, and 2.55 ppm in 1968, 1969, and 1970, respectively. Pinpoint air pollution at the Shakujii Junior High School was not attributable to CO or oxidant conditions because these concentrations were very low. Hypotheses for the occurrence of the pinpoint pollution phenomenon are the fumigation theory, doughnuts-type air pollution theory, wind theory, acrolein theory, downward flow-of-air theory, and the path-of-polluted air theory. Control programs, legal restrictions, and research programs are increasing. Oxidant pollution and pinpoint pollution in the U.S.A. were discussed.

1971

33007 **APTIC NO. 55099**

Farrar, Gerald L.

A LOOK AT EUROPE'S REFINING PROBLEMS AND SOME SOLUTIONS. *Oil Gas Intern., 11(8):36-38, 40, Aug. 1971.*

A review of Europe's refining problems is presented, including such factors as pollution control, high cost of construction, increased crude prices, difficulty in locating new refineries, and supply uncertainties. The trend for eventual removal of lead from European gasolines is turning the processing industry towards consideration of methods such as catalytic reforming and isomerization. Increase in the price of naphtha, a necessary ingredient for catalytic reforming, could lead to a reappraisal of the petrochemical situation and the use of alternative feedstocks. Adoption of maximum limits for fuel-oil sulfur can only be accomplished temporarily by allocation of low-sulfur oils and will eventually necessitate expensive desulfurization measures. Processes for sulfur dioxide removal from stack gases are presently economical only for quantities of more than 50 tons/day. Residual hydrodesulfurization is also being considered, but the process is costly and will result in increased fuel oil prices if adopted widely. Stack heights are increasing, the highest in Europe currently being 700 ft, in an effort to disseminate pollutants at harmless ground level concentrations and to serve as an alternative to overly expensive and complicated stack-gas desulfurization methods.

33008 **APTIC NO. 54836**

Rao, M. N.

AIR POLLUTION IN INDIA. *Indian J. Public Health, 15(4):113-115, Oct. 1971.*

The Government of India set up a National Commission of Air Pollution which is trying to assist the Central Government in formulating legislative measures for control of emissions at their source. Other organizations such as the Institute of Engineers (India), Bombay Corporation, and the Atomic Energy Commission at Trombay, are doing extensive research into air pollution and planning programs for its control. The Indian Standards Institution is helping the nation to standardize the definitions and techniques in the field of air pollution. The Institute at Nagpur under the Council of Scientific and Industrial Research has developed a nationwide survey and is monitoring air pollution at industrial centers like Nagpur, Calcutta, Bombay, Hyderabad, Kanpur, and Madras. Common sources of smoke nuisance in India are industrial and domestic smoke stacks existing side by side. Topographical and meteorological factors also influence air pollution strongly. The problem is viewed as requiring a multi-disciplinary approach.

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